

THE EUROPEAN
SYSTEMS INTEGRATION MARKET

A STUDY FOR
GRUMMAN DATA SYSTEMS

JUNE 1987

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ABSTRACT

This report documents a market study of the opportunities for systems integration projects in Europe carried out by INPUT in the first quarter of 1987. The report provides estimates of market size and growth rates and concentrates on key market sectors, specifically NATO and, for the U.K., MOD, Central Government, and Manufacturing/Engineering. In addition to the U.K., assessments of the West German, Italian, and French markets are also included. The overall market environment in Europe is described from both a user and a vendor standpoint, and the principal competitors in Europe are identified.

This report contains 168 pages, including 64 exhibits.



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CHAPTER 1: INTRODUCTION

I INTRODUCTION

A. OBJECTIVES

- This study has been prepared by INPUT specifically for Grumman Data Systems (GDS). It is based on research conducted by INPUT during the first quarter of 1987, which is proprietary to Grumman Data Systems, and on INPUT's ongoing research programmes in the European computer services market.
- The overall objective of the study was to assess the European systems integration (SI) market so that GDS can determine whether it represents a realistic commercial opportunity.
- Specifically, the study is designed to:
 - Investigate evidence of an emerging SI market (i.e., contracts placed and planned projects).
 - Estimate market size and expected growth rates for the European SI markets.
 - Define existing and potential competitive vendors in that marketplace.



B. SCOPE

- The study covers a number of the principal segments of the Western European systems integration market. Exhibit I-1 provides a diagrammatic representation of this market.
- The study primarily addressed the potential systems integration market for NATO (non-weapons) and the U.K.
- Within the U.K., along with the military non-weapons market (MOD), other important sectors considered were:
 - Manufacturing/engineering.
 - Central government.
- The banking and finance sector was also identified; the remaining part of the market was also examined but aggregated as the 'other' segment.
- In addition to the U.K., a parallel market assessment was carried out for West Germany, Italy, and France.
- In the course of the study, adjacent systems integration markets were identified in the SDI and space sector which were considered relevant to the overall study aims. These were, therefore, also addressed.
- It was established between INPUT and GDS that the systems integration market of prime interest was for contracts valued at \$5 million or more.
- However, this report also provides information about the adjacent systems integration market below \$5 million in contract value. This market is identified as relevant because in Europe most vendors classify a minimum contract value for SI as 'in excess of \$1 million'.



EXHIBIT I-1

GDS STUDY - MARKET DEFINITION

	Military Non-Weapons	Central Government	Manufacturing/ Engineering	Banking and Finance	Other
NATO	H				
SDI/SPACE	L				
U.K.	H	H	H	L	L

H = High Focus
L = Low Focus

WEST GERMANY				
ITALY				
FRANCE				



C. METHODOLOGY

- INPUT agreed to the study approach as set out in the original agreement, included as Appendix B, at a meeting held in December 1986.
- Essentially, the study approach was to employ both field and desk research to collect data and information about the emerging systems integration opportunities in Europe.
- Field research was to encompass at least 20 interviews with both customers (or potential customers) for major IS-type contracts and vendors of such services.
- In fact, INPUT completed some 15 customer interviews, 4 face-to-face and 11 by telephone, and 16 vendor interviews, of which 9 were face-to-face and 7 were by telephone.
- Customer research was undertaken to establish evidence of SI-type initiatives and management attitudes towards placing external contracts for major system development initiatives.
- Vendors known or thought likely to be involved in SI-type work were contacted. In total, 16 vendor interviews conducted by INPUT during the study period provided valuable information about SI-type contracts and bidding activities for this study.
- Desk research encompassed the examination of INPUT files, previous INPUT research, press cuttings, press releases, and other background material.



- Exchange rates used in this study for converting local currency into U.S. dollars were as follows:
 - U.K. - one dollar = 0.67 (\$1.5 = 1 pound).
 - West Germany - one dollar = 2DM.
 - Italy - one dollar = 1,400 lira.
 - France - one dollar = 7 Francs.

D. REPORT STRUCTURE

- The remaining chapters of this report are organised as follows:
 - Chapter II contains an Executive Overview which provides a concise summary of the entire report.
 - Chapter III examines the potential SI market in Europe. In it, INPUT includes a sector by sector analysis providing data or evidence of major contracts and estimates of market size and growth over the five-year forward period to 1991.
 - Chapter IV describes the European market environment for systems integration. This includes sections on market development to date, European vendors' attitudes towards systems integration, and user perceptions of the market.
 - Chapter V contains information about potential systems integration vendors in Europe drawn largely from INPUT's continuous vendor research programmes.



- Chapter VI summarises INPUT's principal conclusions that arise from the conduct of this study.
- The appendices contain the material presented to GDS senior management in April 1987 and a copy of INPUT's proposal for this study.



CHAPTER II: EXECUTIVE OVERVIEW

II EXECUTIVE OVERVIEW

- This Executive Overview is designed in a presentation format in order to:
 - Help the busy reader quickly review key research findings.
 - Provide a ready-to-go executive presentation, complete with a script to facilitate group communication.
- The key points of the entire report are summarised in Exhibits II-1 through II-6. On the left-hand page facing each exhibit is a script explaining its contents.
- The fuller presentation slides used at the meeting with GDS senior management in April 1987 are included in this report as Appendix A.



A. SYSTEMS INTEGRATION IN EUROPE

- The concept of a European systems integration market is relatively new. Care has been taken to identify the segment of highest interest to GDS--the greater than \$5 million contract value sector.
- However, it should be noted that INPUT has also identified a systems integration market, as perceived by European vendors, in the control value range \$1-5 million. Information about this market sector is also included in the report.
- The study primarily addresses the potential SI market for defence (non-weapons) in NATO and the U.K.
- Within the U.K., other key sectors investigated were central government and manufacturing and engineering.
- Other possible sectors were looked at in the U.K., for example, banking and finance, and parallel market assessments were made for West Germany, Italy, and France.



SYSTEMS INTEGRATION IN EUROPE

- Contract Value More Than \$5 Million
 - Market Sectors
 - Defence
 - Government
 - Manufacturing/Engineering
-



B. EUROPEAN MARKET FORECAST

- The exhibit shows the estimated size and projected growth for the four key sectors identified for study.
- In total, it can be seen that these four "high interest" sectors represent a market assessed at \$115 million in 1986 and estimated to reach over \$400 million by 1991, a compound annual average growth of about 30% per year.
- The highest rates of growth are expected to occur in the U.K. defence and U.K. civil government sectors, at 75% and 60% respectively.
- Indeed, the U.K. civil government is expected to reach a level of \$200 million by 1991, thus representing very nearly half of the market defined on this table.
- In comparison, the U.K. manufacturing/engineering sector is only expected to reach a volume of \$40 million by 1991, the annual average growth rate of this sector being assessed at about 20%.



EUROPEAN MARKET FORECAST

SECTOR	EXPENDITURES (\$ MILLIONS)		AAGR (PERCENT)
	1986	1991	
NATO	75	110	8
U.K. Defence	5	85	75
U.K. Civil Government	20	200	60
U.K. Manufacturing/ Engineering	15	40	20



C. CONSORTIA

- One of the key features of the European marketplace is the presence of teaming agreements, joint ventures, and other consortia arrangements.
- Within Europe these seem necessary, not only to share the very heavy bidding costs involved but to provide a representation from vendors of each major country where multinational (i.e., NATO) projects are involved.
- Some major examples of such arrangements are indicated in Exhibit II-3:
 - Airspace Management Systems (AMS) is a consortia that includes Boeing, Alcatel, and Logica. AMS has won the Air Command and Control System study contract for NATO.
 - The Cobra Management Consortium (CMC) is an Anglo-French-German grouping formed to bid for the COBRA Counter Battery Radar programme in NATO. Leading players are Ferranti, Marconi, SEL, Elektronik System, and Le Materiel Telephonique-Professionelle.
 - In the SDI arena in Europe, a number of consortia have been formed. Four of these are American-led, the companies being LTV, RCA, Hughes, and Lockheed.



CONSORTIA

- Airspace Management Systems
 - Cobra Management Consortium
 - SDI
-



D. EUROPEAN SI CONTRACTS

- One of the key aims of this study was to produce evidence of contracts that could be clearly identified as SI.
- This exhibit provides some major examples of SI contracts that have been awarded or are currently being negotiated in Europe.
- An important observation on the European market is the relatively small number of very large contracts. As a result, INPUT has also identified SI million market in the \$1-5 million contract value sector.
- ACCS (Air Command and Control System) and FMCCIS (Future Maritime Command and Control Information System) are both examples of the very large projects to be found in the NATO sector.
- U.K.ADGE (U.K. Air Defence Ground Environment) is a U.K. Defence Sector Project that again underlines the large total contract value in military projects.
- The U.K. Government Data Network Project (GDN) is an example of a new major initiative towards SI approaches in the civil government area.
- GDS's own SI contract with Rolls Royce was considered to be an exception. In the manufacturing/engineering sector, most SI-type contracts identified by INPUT were relatively small, \$10 million and below.



EUROPEAN SI CONTRACTS

- **ACCS \$750 Million**
 - **FMCCIS \$1,000 Million**
 - **UKADGE \$400 Million**
 - **GDN \$200 Million**
 - **Rolls Royce \$40 Million**
-



E. EUROPEAN SI MARKET ENVIRONMENT

- The European market has to be viewed as relatively immature at this stage. As already pointed out, the number of very large contracts is relatively small.
- INPUT identified an adjacent below \$5 million contract value market to provide GDS with a broader picture of European market conditions.
- An important feature within Europe over the last few years has been the development of a number of very sophisticated software houses or professional services companies like Systems Designers, Logica, and CAP GEMINI SOGETI.
- These companies have been identified as repositories of considerable expertise in providing software engineering solutions and have to some extent assumed ascendancy over the traditional electronics manufacturers even in the defence sector.
- Political factors are essential to an understanding of the European marketplace. These operate both at the pan-European level (e.g., NATO) and within each individual country market.



EUROPEAN SI MARKET ENVIRONMENT

- **Immature Market**
 - **Below \$5 Million Contract Sector**
 - **Software Houses/Professional Services Companies**
 - **Political Factors**
-



F. CONCLUSIONS

- The emerging SI market in Europe is a developing opportunity which is open to GDS should it wish to exploit it.
- This market must be studied carefully so that GDS can assess the appropriate sectors and the best approaches to them.
- Clearly, the securing of the Rolls Royce contract provides a very substantial platform from which GDS can develop further in these markets.
- It is vital that a local presence be established in order to fully track developments and gain acceptance and credibility.
- GDS must give consideration to partnerships and joint ventures. Clearly, there are other organisations within Grumman Corporation whose activities and presence in Europe would be symbiotic with the aims of a GDS European initiative.



CONCLUSIONS

- **Developing Opportunity**
 - **Need for Local Presence**
 - **Consider Joint Ventures**
-



CHAPTER III: THE EUROPEAN SI OPPORTUNITY

III THE EUROPEAN SI OPPORTUNITY

A. MARKET SIZE AND FORECAST

I. MARKET DEFINITION

- The geographic and sector coverage of the European market for this survey was described in Chapter I, Section B. This subsection defines the term systems integration.
- The use of the term systems integration is relatively new in the European market. Awareness of the concept of systems integration can to a considerable extent be attributed to the marketing activity of EDS. For example, CAP GEMINI SOGETI, the largest European professional services vendor, has felt it necessary to issue a statement defining its own role in systems integration in response to EDS's recent initiatives in the French market.
- The term systems integration is best defined by describing the general market characteristics that are evident in this market sector. These can be described as follows:
 - Systems integration is an approach to the development of new, upgraded, or expanded information systems for client organisations. In



this approach, a vendor or team of vendors assumes responsibility for providing the information products and services which result in a comprehensive solution to the client's information systems problem.

- This approach is most applicable to major project efforts that involve the development of complex, multidisciplinary systems. The typical size of these projects, the fact that large portions of the software must be custom developed, and/or the substantial network requirements usually means that the total project effort is multi-year.
- Systems integration involves not only the actual integration or interfacing of the components of the solution but also:
 - The analysis of the problem.
 - The design of the solution.
 - The selection, development, and implementation of the hardware and software.
 - Such post-implementation support as testing, client staff training, documentation, and, in some instances, operation and maintenance of the newly-developed system for a specified period of time.
- Generally, these projects are bounded at the start by the selection of the successful bidder and at the end by the acceptance of the new system by the client.
- Critical to the approach from both the client's and vendor's perspectives is the sharing or total transfer of responsibility (and risk) for the successful development of the system from the client



organisation to the vendor(s). In exchange for assuming the risks of failure to deliver the desired solution on time and within budget, the integrator receives not only management fees from the client but also markups from subcontractors and the 'inside track' in providing any of the products and services that comprise the total solution.

- Exhibit III-1 enumerates the component products and services that may be a part of a systems integration project and from which the vendor can expect to receive revenue. Since each project is unique in terms of specific requirements, not all of these components are applicable to all SI projects. Further, the unique requirements dictate the proportion of the total project expenditures to be made for each component involved.
- INPUT's research work in the U.S. has identified the systems integration market as comprising contracts valued at \$5 million or more in total.
- In Europe, INPUT's research has revealed a tendency by vendors to perceive the systems integration market as comprising contracts valued in excess of \$1 million as a minimum.
- INPUT has, therefore, identified these two market segments separately for GDS in this study.

2. MARKET SIZE AND FORECAST

- The overall market projection for SI in Western Europe as defined in this study is shown in Exhibit III-2.
- INPUT projects that the principal SI market of interest to GDS, that for contracts in excess of \$5 million, will grow from \$220 million in 1986 to \$1,828 million in 1987. This represents annual average growth of just over 50%.



EXHIBIT III-1

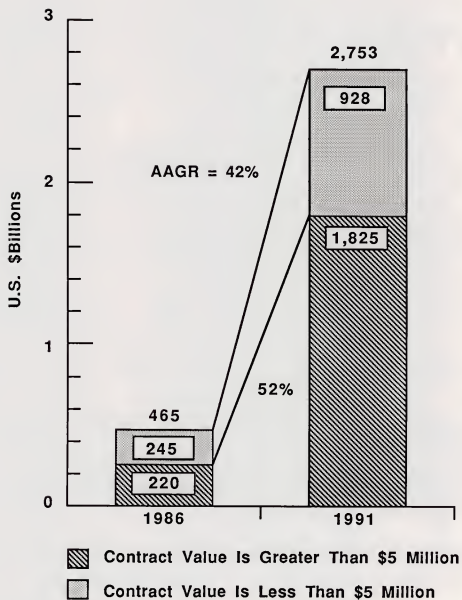
PRODUCTION/SERVICES IN SI PROJECTS

- **Hardware**
 - **Information Systems**
 - **Communicatons**
- **Software Products**
 - **Systems Software**
 - **Applications Software**
- **Professional Services**
 - **Consulting**
- **Feasiblilty and Tradeoff Studies**
- **Selection of Hardware, Networks and Software**
 - **Project Management**
 - **Design/Integration**
 - **Systems Design**
 - **Installation of Hardware, Networks and Software**
 - **Demonstration and Testing**
 - **Education/Training and Documentation**
 - **Operation and Maintenance**
- **Other Miscellaneous Products/Services**
 - **Data Processing Supplies**
 - **Processing/Network Services**
 - **Data/Voice Communications Services**



EXHIBIT III-2

EUROPEAN MARKET GROWTH





- Additionally, INPUT has identified an adjacent SI market in Europe for contracts valued between \$1 million and \$5 million. INPUT projects that this market will grow from \$245 million in 1986 to over \$900 million in 1991. This represents an annual average growth of about 30%.
- Thus, in total there is an overall SI market which has been identified that reached \$465 million in 1986 and is projected to reach \$2,750 million by 1991 at an annual average growth rate of over 40%.
- Exhibits III-3 and III-4 provide a more detailed analysis of the market showing the estimated size and growth of each country market together with the separately identified markets of NATO and Space.
- Exhibit III-3 shows the analysis of the various market sectors studied for the \$5 million and above contract market. Exhibit III-4 shows the analysis for the below \$5 million sector.
- Exhibit III-5 shows the proportional composition of the greater than \$5 million market in both 1986 and 1991 as estimated for the major market sectors as defined for the European market.
- Exhibit III-6 shows the proportional composition of the greater than \$5 million market in the U.K. estimated for both 1986 and 1991.



EXHIBIT III-3

EUROPEAN MARKET SUMMARY - \$5 MILLION AND ABOVE
(\$ Millions)

MARKET SECTOR	1986	1987	1988	1989	1990	1991	1992	1993	1994
NATO	75	75	75	80	90	110	NE	NE	NE
Space	-	5	10	20	35	40	NE	NE	NE
U.K. Defence	5	25	55	80	85	85	NE	NE	NE
U.K. Civil Government	20	40	80	145	190	200	210	220	220
U.K. Manufacturing/ Engineering	15	20	25	30	35	40	NE	NE	NE
U.K. Banking/ Finance	10	13	16	20	27	35	NE	NE	NE
U.K. All Other	10	15	25	35	50	75	NE	NE	NE
U.K. Total (Rounded)	60	113	201	310	387	435	NE	NE	NE
West Germany Total	40	85	155	230	335	460	NE	NE	NE
Italy Total	5	25	80	140	210	320	NE	NE	NE
France Total	40	80	150	235	350	460	NE	NE	NE
European Total	220	383	671	1,015	1,407	1,825	NE	NE	NE

NE - NOT ESTIMATED



EXHIBIT III-4

EUROPEAN MARKET SUMMARY - BELOW \$5 MILLION
(\$ Millions)

MARKET SECTOR	1986	1987	1988	1989	1990	1991	1992	1993	1994
NATO	5	6	6	7	7	8	NE	NE	NE
Space	-	-	-	-	-	-	NE	NE	NE
U.K. Defence	10	12	14	16	18	20	NE	NE	NE
U.K. Civil Government	-	-	5	8	11	15	NE	NE	NE
U.K. Manufacturing/ Engineering	10	12	15	20	25	30	NE	NE	NE
U.K. Banking/ Finance	90	105	125	145	170	200	NE	NE	NE
U.K. All Other	30	35	45	50	60	70	NE	NE	NE
U.K. Total (Rounded)	140	164	204	239	284	335	NE	NE	NE
West Germany Total	50	70	95	125	170	230	NE	NE	NE
Italy Total	10	15	25	45	75	135	NE	NE	NE
France Total	40	55	80	110	160	220	NE	NE	NE
European Total (Rounded)	245	310	410	525	700	925	NE	NE	NE

NE = Not Estimated



EXHIBIT III-5

EUROPEAN MARKET OVERVIEW
GREATER THAN \$5 MILLION MARKET

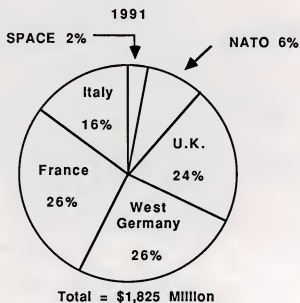
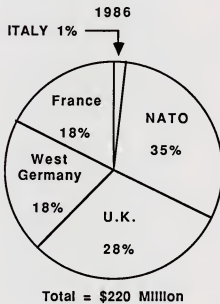
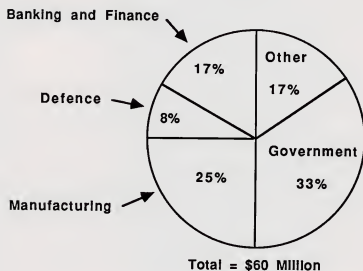




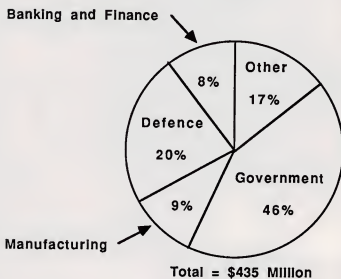
EXHIBIT III-6

U.K. MARKET OVERVIEW
GREATER THAN \$5 MILLION MARKET

1986



1991



YGRU



B. MARKET ANALYSIS

I. NATO

a. General

- The NATO budget is expended on developing military infrastructure; for example, pipelines, airfields, and communication and control systems. In contrast, specific weapons expenditure is controlled by each individual NATO member country. Individual host nations develop projects partly funded by NATO.
- An important concern in respect of viewing NATO as a potential market for GDS is the political environment in Europe.
- The European governments would like to see more of NATO's defence policy and its weapons made in Europe. It is, therefore, not unreasonable to assume that political pressure exists to maximise NATO non-weapons expenditure in Europe as well.
- European ministers have called for closer European cooperation on defence spending, including:
 - Economic management and defence procurement.
 - Military research.
 - Role specialisation and joint training.
 - Common programmes on the NATO/Airborne Warning and Control System (AWACS) model.



- Further development of the Independent European Programme Group.
- To date, the NATO market has been dominated by U.S. companies through their ability to demonstrate a much deeper experience profile than their potential European competitors. They can, for example, leverage their U.S. experience for prototypes to be demonstrated to NATO.
- However, it is important to note that it is vital that U.S., companies bidding for European business to have a local European presence, for example, CSC.
- In the past, the cost of bidding, the lack of experience and track record, and the small size of the European service companies have in general denied them any success in this market with the exception of Logica.
- NATO's total defence budget (for 1986) has been assessed as follows:

- U.S. (Western Europe)	\$116.0 billion
- France	28.4
- U.K.	28.2
- West Germany	27.8
- Italy	13.6
- Others	<u>18.0</u>
	232.0 billion

- The vast majority of this expenditure is for weapons systems. Most expenditure is contracted for directly by the individual countries or purchased on behalf of NATO by an individual country, for example, the NATO IV satellites.
- Specifically, the NATO market for non-weapons SI is a relatively small and highly specialised market, but nevertheless offers some specific and substantial opportunities.



- The formation of consortia to bid for and execute NATO contracts is, however, a key feature of this market. SD, Scicon, and SSL formed a consortium to obtain defence study contracts but were unsuccessful against the large U.S. companies like Boeing and Hughes. This effort was abandoned.
- Logica has, however, competed as part of the Airspace Management Systems (AMS) consortium, a joint venture including Boeing and Alcatel. AMS has won the Air Command and Control System (ACCS) study contract.
- In line with the political need for closer European cooperation on NATO projects and the sheer size and scale of the projects, there is evidence amongst the potential vendors of considerable activity in forming consortia.
- Exhibit III-7 lists the main consortia that INPUT has identified in the NATO market.
- Computer system procurement for NATO is largely handled through a NATO organisation called North Atlantic Information Services Agency (NATISA).
- However, this is not always the case, and it has not yet been decided, for example, whether the upcoming ACCS project will be handled through NATISA or through a separate agency. Each of these large projects has its own coordination group at NATO headquarters.
- SHAPE also deals directly with contractors for their own projects.
- Each NATO country also has its own delegation at NATO headquarters in Brussels, and most vendors make contact through these in the first instance.
- A payments and prices committee vets all NATO contracts.
- NATO procurement operates on the basis of compliancy with technical specification. At the final stage, selection is based on the lowest-cost technical compliant solution.



EXHIBIT III-7

CONSORTIA

- Airspace Management Systems
 - Logica
 - Boeing
 - Alcatel
- Cobra Management Consortium - CMC
 - Ferranti
 - MARCONI Radar Systems
 - SEL
 - Electronik System
 - Le Marelei Telephonique - Professionelle
- BAe/MARCONI (NATO IV Satellites)
 - GEC AVIONICS (U.K.)/Bodenseewerk Gattetechnik (W.G.)/
Aeritalia Avionic Systems and Equipment Group (Italy)/
Insel (Spain) (To bid for EFA Advanced Flight Control System)
 - CAP, Ferranti, Plessey (To bid for a surface to surface shipboard
communications system)



- NATO also operates a significant quality assurance procedure called NATO Quality Insurance Standard Approval. It is important that vendors get approval in order to bid for NATO contracts.

b. Projects

- Exhibit III-8 lists the principal planned NATO projects identified by INPUT. Some details of these projects are given below.
 - The ACCS project is estimated to be worth in excess of \$750 million at least and possibly as much as \$2 billion in total. So far, only a study contract has been awarded to Airspace Management Systems, a consortia including Boeing, Alcatel, and Logica.
 - An Anglo-French-German management consortium has been formed to bid for COBRA, the European country battery radar to be deployed in the 1990s at a total cost of about \$750 million. The equipment, which is expected to be procured by all three countries, uses phased array radar and advanced data processing to detect and classify incoming projectiles in a battle area. Such a radar can look into the total forward volume of a battle area without a moving (scanning) antenna and can 'see' virtually all points in it at the same time.
 - British Aerospace has won a contract worth more than 100 million pounds to supply two military communications satellites for NATO. It is the first major satellite contract NATO has awarded outside the U.S. The first of the two satellites will be launched by the U.S. space shuttle early in the 1990s. Named NATO IV, they will be almost identical to the three Skynet 4 satellites which BAe is already building for the British forces. The contract will provide work for Marconi Space Systems in Portsmouth, part of the GEC group, as well as BAe's space and communications division.



- The new satellites will handle military and diplomatic signals between the NATO nations into the next century, complementing the network of American-built satellites the organisation already uses. The design was derived from civil satellites built by BAe for use by European shipping.
 - This contract is an example of a purchase on behalf of NATO by a member country.
 - ACCIS (Command and Control of Information across Europe) is a major C³I project. The RAF CCIS part is known to be in excess of \$150 million.
 - Another expected project is FMCCIS, the Future Maritime Command Control System. No clear details are yet available for this project.
 - The European Data Distribution System (EDDS) is another very large project about which few details are available. BAe is known to be the U.K. leader in an international consortium for work on this project.
 - BITS and BICES are two very major projects known to be only at the pre-study design stage.
- Some other NATO contracts which are generally subsidiary parts of the overall major projects are described below.
 - Systems Design and Integration Contract (SD&IC) is a \$6 million fully funded contract to design NATO's Command and Control Architecture. Hughes Aircraft is a prime contractor bidding for this, with Scicon as a subcontractor. The implementation phase is expected to exceed \$15 million.



- Another project is developing proprietary software for Digital PDP II equipment for a message switching system for 19 NATO sites. The contract is for at least \$10 million per NATO country and will involve maintenance contracts.
- There is surface-to-surface shipboard communications system for which CAP, Ferranti, and Plessey have formed a consortia to bid.
- Other projects exist at this stage only at a preliminary level of development; for example, SHF, a project concerned with high frequency radio transmission.
- An example of a contract placed by SHAPE is for a wartime headquarters information display and dissemination system. It is a \$4.5 million contract to SIGMEX Ltd.
- Another project, known as BRASS, is a ship-to-shore communications system. BAe is understood to be heading up a consortium to bid for work on this project.

c. Market Size

- In formulating this market estimate a number of assumptions have been made. In general, it has been assumed that approximately 20% of the total project spent, as shown in Exhibit III-8, is related to computer system expenditure as opposed to other hardware procurement, e.g., radar, satellites, ground stations, and other noncomputer-related expenditure.
- Exhibit III-9 shows how INPUT has projected the SI revenue for the major NATO projects identified in Exhibit III-8.
- INPUT has estimated that current NATO expenditure on non-weapons computer systems development projects is of the order of \$70-80 million per year. Revenue from current projects will decline over the forecast period, and the assumed pattern is shown in Exhibit III-9.



EXHIBIT III-8

SYSTEMS INTEGRATION PROJECTS
NATO

PROJECT	Estimated Total Value (\$Millions)
ACCS - Air Command and Control	750+
COBRA - Counter Battery Radar	750+
NATO IV - Satellite Communications	150+
ACCIS Command and Control of Information Across Europe	1,000
FMCCIS Future Maritime Command and Control Information System	1,000
EDDS European Data Distribution System	500
BICES Battlefield Information Communication Equipment System	750
BITS Battlefield Information Targeting System	750



EXHIBIT III-9

NATO MARKET: CONSTITUENT PROJECTS

PROJECT (Value \$Millions)	1986	1987	1988	1989	1990	1991	1992	1993	1994
ACCS (150)	-	-	2	8	20	30	40	30	20
COBRA (150)	-	-	5	10	20	25	30	40	20
ACCIS (100)	-	-	3	5	12	20	20	20	20
FMCCIS (100)	-	-	-	-	3	5	12	20	20
EDDS (50)	-	-	-	2	4	4	10	10	10
BICES (150)	-	-	1	2	5	10	15	20	20
BITS (150)	-	-	1	2	5	10	15	20	20
Subtotal	-	-	12	29	69	104	142	160	130
Other Projects	70- 80	70- 80	60- 70	45- 55	15- 25	5- 10	-	-	-
Total (Rounded)	75	75	75	80	90	110	NE	NE	NE

NE = Not Estimated



- Exhibit III-9 also shows the formulation of the overall rounded total estimate to market size for the NATO sector over the forecast period 1986-1991.
- It can be further seen in the projections beyond this period (1992-1994) that uneven growth is exhibited due to the very large contract values and the small number of contracts involved.
- This forecast shows the NATO market increasing from \$75 million in 1986 to around \$110 million in 1991, an annual average growth rate of 8%.
- It is also estimated that a further small market exists in the less than \$5 million contract value area. This is estimated to grow from an annual level of about \$5 million in 1986 to about \$8 million by 1991.

2. OTHER EUROPEAN OPPORTUNITIES

- Some other SI opportunities exist which can most conveniently be grouped under the heading 'other European'. These are principally:
 - Star Wars or SDI contracts.
 - European commercial satellite and space contracts.
- The EEC administration is not considered by INPUT to be a viable SI opportunity in the near or mid-term future.
- EEC projects that have been promoted appear to be on a very limited budget; for example, there is an initiative to develop computer links between European Stock Exchanges as part of a plan for a continental-wide electronic trading floor. The EEC is to provide just over \$3 million towards this.



a. Star Wars

- This subsection is included for primarily information purposes, since this area is not considered as a primary opportunity area for GDS in Europe. The purpose of placing Star Wars contracts in Europe is at least partly political; hence, Caspar Weinberger's announcement in December 1986 about some of these contracts.
- The sums being spent in Europe need to be put in perspective against the U.S. expenditure on SDI of \$2.7 billion in 1986. Those announced by Weinberger in December 1986 amounted in total to \$14 million.
- However, this work may have some relevance to GDS for the purposes of building commercial relationships. Consortia of American and European companies are a feature of this area. Current consortia include:
 - Four American led.
 - One Italian led.
 - One French led.
 - One West German led.
- Companies involved in these consortia are listed in Exhibit III-10. Each of these seven contracts is worth approximately \$2 million.
- The U.K. MOD has reported (February 1987) that to date SDI contracts awarded to the U.K. amount to around \$35 million. At least \$10 million of this will be spent in Ministry of Defence research establishments.
- Amongst U.K. organisations benefitting from these contracts are BAe, Ferranti, Marconi, Oxford Analytical Instruments, Hunting Engineering, EASAMS, and Scicon.



EXHIBIT III-10

SDI - EUROPEAN CONSORTIUM LEADERS

- **LTV Aerospace and Defence**
- **RCA**
- **Hughes**
- **Lockheed**
- **SNIA BPD (Italy)**
- **Messerschmitt, Boelkow, Blohm (West Germany)**
- **CoSyDe (Thomson CSF/Aerospatiale) (France)**



- Most of these contracts concern theatre defence architecture.
 - The European Architecture Study (EAS) is intended to examine the threats a SDI system would have to cope with in Europe.
 - The EAS has been divided into five areas, and the following U.K. participation has been identified:
 - A Concepts Group led by PA Defence Services.
 - Systems Integration headed by Hunting Engineering with Logica and Plessey also involved.
 - Weapons under BAe with GEC-Marconi, Scicon, and CAP.
 - Sensors led by GEC-Marconi with BAe, Racal, Software Sciences, and Thorn EMI.
 - Battle Management headed by Plessey with Logica support.
 - EASAMS has been contracted to do an SDI study for the Battle Management and Command Control and Communications (BM/C3) in the European Theatre of Defence.
 - Ferranti has been contracted to do a study for an Allied Test Bed. EASAMS is a subcontractor.
- b. Space
- A number of SI opportunities appear as a result of the various European space initiatives.



- For example, Logica has just won a contract for defining software required for the European Space Agency's Columbus space station programmes.
 - The Logica contract is expected to be a lead into a series of development contracts which will incidentally use ADA. It is concerned with investigating software techniques required for running computerised equipment and the techniques needed for radio transmissions.
 - The overall contract is worth about four to six million dollars. Logica's space and defence systems division will be responsible for about \$700,000 of the work, which brings Logica's Columbus related work to about \$1.5 million. Other participating companies are:
 - Messerschmitt, Boelkow, and Blohm (West Germany).
 - CRI (Denmark).
 - SAAB (Sweden).
 - The Columbus space programme is in total an \$18 billion project involving the U.S., Europe, Japan, and Canada. About \$2.6 billion will come from the European Space Agency (ESA), a 13-nation group. Prime contractor is MBB-Erna. About \$130 million is expected to be spent in total on software development.
- Marconi Defence Systems has obtained a \$4.5 million order from the ESA to supply three advanced transportable earth stations. Siemens Ltd. has a contract (seven million dollars) to provide high-power amplifiers for an Olympus satellite which will carry teleconference and business communications.



- Logica, with a number of other firms, has formed Cospace to pool U.K. high technology expertise.
 - COSPACE has been chosen by the ESA to determine its information technology needs for both missions and simulation. It is also advising the U.K. DTI on bit types for telecommunication satellites and is looking at the design of a biology facility for the planned Columbus space station.
 - The British National Space Centre has also awarded COSPACE a contract to evaluate the U.K.'s current capabilities in space technology.
- There is a European initiative (Hermes) to design a small space shuttle capable of taking people into space.
 - Total budget allocated to the preparatory phase of this programme is \$70 million. This will provide the outline design of Hermes, a small winged vehicle which would enter orbit on top of an Ariane rocket.
 - In total, the full project, were it to get the go-ahead (decision due Summer 1987), would be approximately \$7 billion.
- At the moment the U.K.'s annual space budget is about \$150 million. Now that it is joining Hermes, it is expected to double to \$300 million. It is likely that some U.K. companies will benefit, e.g., GEC, British Aerospace, and Smiths Industries.
- Some software development projects have also been announced by the European Telecommunications Satellite Organisation (EUTELSAT).
 - Logica has been given responsibility for EUTELSAT's satellite control centre, telemetry, and command and ranging baseband equipment procurement.



- INPUT estimates the SI opportunity to total \$30 million for this programme.
- British Aerospace has a contract for INMARSAT-2, the second generation of international maritime communications satellites. BAe has subcontracted NEC to supply Tracking Telemetry and Command (TT&C) C-band satellite transponders.
- INMARSAT should also represent a \$30 million SI opportunity.
- As well as Logica, another U.K.-based company generating revenue from space activity is Software Sciences. Reputedly, SSL did \$3 million worth of space business in 1986.
- Exhibit III-11 provides an estimate of the total market for SI expenditure over the forward period in the space sector.
- Assuming the future development of other projects not identified at this time, it is not unreasonable to project an SI market in this sector achieving a level of \$40 million by 1991.
- It has been assumed that no market for SI contracts below the \$5 million level exists for this segment.

c. Other Projects

- Other pan-European projects may well evolve during the period under study.
- For example, one banking project on a European scale is SWIFT II, which had a \$370 million budget and is now two years behind schedule and well over budget. This is a system designed to link 1,361 banks in Europe over a network exchanging 900,000 messages per day. It has not been contracted out to a third-party organisation.



EXHIBIT III-11

EUROPEAN 'SPACE' SECTOR: CONSTITUENT PROJECTS

PROJECT (Value \$Millions)	1986	1987	1988	1989	1990	1991	1992	1993	1994
COLUMBUS (130)	-	2	3	10	20	25	30	25	15
EUTELSAT (150)	-	-	-	2	3	8	8	5	4
INMARSAT -2	-	2	3	8	8	5	4	-	-
Subtotal	-	4	6	20	31	38	42	30	15
Other Projects	-	-	0-5	0-5	0-5	5-10	NE	NE	NE
Total (Rounded)	-	5	10	20	35	40	NE	NE	NE

NE = Not Estimated



- No estimate of this potential market has been included in this report.

3. U.K. DEFENCE

a. General

- Defence contractors to the U.K. Ministry of Defence (MOD) have for some time been facing a more stringent buying/contracting environment. The most extreme recent example of the new approach was the decision to cancel the contract with GEC Avionics for the NIMROD early warning radar system (\$1,300 million spent).
- This decision has left the entire U.K. defence industry in no doubt that the easy days of cost-plus contracting are over.
- Mr. Peter Levene, the MOD Chief of Defence Procurement, has revealed that all big new development contracts over the last couple of years have been let on a fixed or maximum price basis.
- In addition, the MOD has learnt the necessity of giving responsibility for project management to a single prime contractor.
- Software development has been identified as the main problem (resulting from the complexity of software required in modern systems) and, in addition to NIMROD, is also being cited as the major problem in two current projects in difficulty:
 - GEC's Foxhunter radar.
 - Ferranti's surface ship command system.
- Another important observation concerning the U.K. defence market has been the rise in acceptance of the 'traditional' software houses as defence



contractors. This is compatible with the increasing importance being placed on complex software development.

- Thus, Logica, CAP, Scicon, Systems Designers, and Software Sciences have all emerged as significant players with the skills to challenge the traditional virtual monopoly of defence work by such companies as British Aerospace, Ferranti, Marconi, and Plessey.
- Gresham-CAP, the CAP joint venture company with the Dowty Group, was, for example, preferred for the recent Royal Navy submarine command control system over the traditional supplier Ferranti.
- The growth of the defence-related business, both weapons- and nonweapons-related, for the 'traditional' U.K. software houses is illustrated in Exhibit III-12. The other defence contractors category includes some other systems houses, e.g., Admiral Computing and John Bell Technical Services, as well as the software development revenue of the traditional defence contractors like Ferranti and Marconi.
- There is also some evidence of new groupings in this sector. Digital and Gould are both known to be active in attempting to gain U.K. MOD work.
- The MOD has also changed its contracting procedures and computer policies over the last couple of years (influenced by the NIMROD saga).
- As well as contracting directly with software development vendors, it has also stopped building unique computer hardware for new defence systems and instead is prepared to buy computers based on civilian standards.
- The MOD is also reopening some existing long-term contracts so they can be replaced by fixed-price contracts using cheap off-the-shelf kits.



EXHIBIT III-12

**U.K. DEFENCE SECTOR
Systems House Revenue**

VENDOR	1983	1984	1985	£M 1986*
SCICON	8	10	13	16E
SD	7	10	15	20E
LOGICA	5.5	8	10.8	17
SSL	?	?	11	13E
CAP	3	3	10.5	12.5
YARROW	-	-	12.5	15E
Other Defence Contractors	20	30	40	50
Total	45	70	110	150

*E = Estimated



- Moves have also been made to open up more possibilities for MOD work with smaller firms. The MOD vetted Defence Contractors List contains some 2,500 companies in total.
- MOD bidding procedures are based around the principal of 'best value for money'. Consequently, the cheapest bid (unlike NATO) does not necessarily win; a view is taken of the technical solution considering such factors as expandability and whole-life cost.

b. Projects

- Exhibit III-13 lists the most significant defence contracts known to be currently active. Total contract values shown are estimates that relate to the computer-based developments.
- The Trident submarine programme involves a \$100 million (estimated) project for computer-controlled monitoring of the nuclear reactors.
- ADCIS (a C³I project for air defence of the BAOR). SD and SSL are both bidding for initial contracts in this project. The total value is estimated to be in the range of \$20-45 million.
- The U.K. Air Defence Ground Environment (UKADGE) is a modernisation programme for the existing system. It is a system that provides communications for fighter control bases and headquarters.
 - The system is currently under development by Plessey/Marconi and Hughes Aircraft Company at a total cost of around \$400 million with total SI contracts probably being worth about \$80 million. (It is estimated that the project will include some ten million lines of code.) It is scheduled for delivery in the mid-1990s and is probably two to three years behind schedule due to delays with the control computer system.



EXHIBIT III-13

**SYSTEMS INTEGRATION PROJECTS
U.K. DEFENCE SECTOR**

PROJECT	(\$M)
TRIDENT (Monitoring System for Nuclear Reactors)	100
ADCIS	20-45
UKADGE U.K. Air Defence Ground Environment	80
SUCCESSOR Submarine Command System	40
CHOTS (Computer HQ Office Technology System)	30
UNITER Network	40
FASTNET Army Communications Network	40



- SSL is understood to be doing subcontract work on this project.
- SUCCESSOR (the submarine programme). Gresham-CAP, a joint venture company of the Dowty and CAP groups, won the \$130 million contract to develop and introduce in the early 1990s a command system for RN submarines. About \$30 million is anticipated to be spent on the software development aspects.
- CHOTS (Computer HQ Office Technology System). CSC has been awarded the Phase I contract worth about \$1 million to provide management and technical consultancy. The CHOTS system when fully implemented would provide OA support to approximately 24,000 MOD staff.
- In total, CHOTS is estimated to be worth about \$150 million with \$30 million accounted for by the CORE one computer system development aspects.
- The UNITER Network. GEC Telecommunications has been awarded a \$140 million four-year contract to be prime contractor for the second stage of project Uniter which involves building a U.K.-wide digital speech and data network to modernise ground communication for the Royal Air Force. The second phase is to provide a secure, survivable integrated network to handle speech, packet, and message switching including electronic mail. The SI element of this total contract is estimated at \$40 million.
- The British Army has announced plans for Phase I of the modernisation of its private communications network project FASTNET. BT is the main contractor with Plessey as a \$20 million subcontractor for equipment supply and installation. The existing electromechanical switch-based network is being replaced with ISDN compatible broadband digital circuits. The Phase I award covers 10,000 subscribers', the whole system will eventually accommodate 30,000. The SI contract is estimated at around \$40 million.



- A variety of other defence contracts have been awarded that are relevant to the MOD SI market. Some of these are described below.
 - The Identification Friend or Foe (IFF) system is an estimated \$600 million project (to be coordinated through NATO) that has currently been delayed for at least two years.
 - The British Army has awarded a \$1.5 million message switching contract to Scicon, which is employing six subcontractors for the project.
 - An MOD contract worth about \$3 million using Tandem hardware and including software development, communications, distributed processing, and software is now in its second phase.
 - Ferranti has received an order worth \$7 million to supply the Royal Navy with data link equipment. The contract covers the development and initial production of 17 Data Link Pre-Processors (DLPPs).
 - The Royal Navy is fitting and refitting several classes of its vessels with Rediffusion's ICS25 integrated communications systems using fibre optic technology.
 - The MOD has awarded a \$1.5 million plus contract to Pye Telecommunications under a defence scheme code named Project Mould. The job involves upgrading the U.K.'s Home Defence communications systems.
 - This three-year contract involves the servicing and maintenance of mobile radio command and control systems in each of the Home Defence regions on the U.K. mainland. The communications equipment is to be supplied by Pye and includes base stations, associated control equipment, mobiles, and



facilities for selective calling. It was previously maintained by Army personnel.

- The Automotive Laboratories of the Royal Armament Research and Development Establishment (RARDE) at Chertsey gave CAP Scientific a \$1.5 million support contract in June 1986.
- ERSYS, a Southampton U.K.-based company, has been awarded a contract to develop software and computer hardware for helicopter rotor damper testing. The contract was awarded in 1986, and its value is unknown.
- In 1986, Thorn EMI Electronics was awarded a contract to design a hemispherical trials demonstrator for helicopter obstacle warning devices. The value of the contract is not available.
- Ferranti Defence Systems has won a \$4 million contract for test equipment for Ferranti moving map displays on Harrier aircraft.
- Another large MOD project is a \$36 million development of what is claimed to be the largest automated warehouse in Europe. The \$36 million cost is divided equally between Norwest Holst, a building construction group, and Dexion, the materials handling and storage specialist company. Dexion supplies computer-controlled courier access systems, rail-guided trolleys, and automatic guided vehicles (AGVs). Digital PDP minicomputers are being used. The software development element (possibly placed with CAP PLC) is estimated to be worth \$1 million.
- NAVTIS is an action information system for HMS Fearless. A \$4.5 million contract to Plessey Naval Systems.



- The development of an airborne 1,000 word continuous speech recogniser for RAE Farnborough has resulted in a \$1 million contract to Marconi defence Systems Ltd.
- Marconi Communications Systems has a \$1.5 million contract to supply an advanced version of ICS3 (Integrated Communications System) to the Royal Navy for its new 23 Duke Class Frigate.
- ICL has a \$750,000 contract to supply a Series 39 Level 30 mainframe and DRS terminals for the RAF command and control systems in West Germany running ICL's Air Staff Management System.
- NITS--the largest contract yet awarded for an Information Technology (IT) strategy study--has been awarded to a consortium led by Coopers & Lybrand including software houses CAP and CSC. Period of the study is 12-15 months.

c. Market Size

- Exhibit III-12 shows the development of defence business for the traditional systems houses based in the U.K. and a total market estimate for system development projects.
- This MOD expenditure was estimated at 150 million pounds (\$225 million) for 1986. It is further estimated that this is constituted as follows:

- Non-weapons systems	25 million pounds	\$ 37.5 million
- R&D	15 million pounds	\$ 22.5 million
- Weapons systems	110 million pounds	\$ 165.0 million



- Exhibit III-14 shows the estimated revenue generation of the contracts identified in subsection above for the U.K. defence sector together with an estimate of other unidentified future projects.
- Thus, it can be seen that on the basis of this data, the above \$5 million contract market will grow from \$5 million in 1986 to an \$85 million market by 1991, representing an AAGR of 76%. Growth of this market further is speculative, based increasingly on assumptions about future unspecified projects.
- The total \$37.5 million (25 million pounds) estimated to have been expended in 1986 (see above) is further assumed, on the basis of other smaller contracts identified, to include at least \$10 million for SI contracts falling into the below \$5 million contract category. INPUT estimates that expenditures on these systems will double to at least \$20 million by 1991.

4. U.K. CIVIL GOVERNMENT

a. General

- A considerable opportunity is expected in this sector as a result of the civil government's continuing difficulties in recruiting appropriate staff and as the direct result of deliberate policy to encourage U.K.-based service companies.
- Civil government expenditures on computer systems are generally influenced (but it is not mandatory) by the Central Computer and Telecommunications Agency (CCTA). This group (part of HM Treasury) is highly influential in computer system purchasing decisions.
- The government recognises the need to attack the critical problem of software development. It perceives that these are only two basic options open to it:



EXHIBIT III-14

U.K. DEFENCE SECTOR: CONSTITUENT PROJECTS

PROJECT (Value \$Millions)	1986	1987	1988	1989	1990	1991	1992	1993	1994
TRIDENT (100)	-	-	5	10	15	20	20	20	10
ADCIS (30)	-	-	2	4	9	10	5	-	-
UKADGE (80)	5	10	15	20	20	10	-	-	-
SUCCESSOR (40)	-	-	5	10	10	10	5	-	-
CHOTS (30)	-	1	3	6	10	5	5	-	-
UNITER (40)	-	5	10	15	10	-	-	-	-
FASTNET	-	5	10	15	10	-	-	-	-
Subtotal	5	21	50	80	84	55	35	20	10
Other Projects	-	-	-	0-5	0-10	25-45	NE	NE	NE
Total (Rounded)	5	25	55	80	85	85	NE	NE	NE

NE = Not Estimated



- Increased efficiency through the use of software development tools.
- The utilisation of outside services.
- Unfortunately, to date the Civil Service has had very mixed success in getting software development completed by third parties. Problems identified by the CCTA are getting the specification right, controlling the project remotely, and the level of adaptation of vendors to Civil Service procedures.
- It must also be recognised that the Civil Service must retain ultimate control of a project since they are accountable to the government and House of Commons.
- Some problems perceived by computer systems vendors in dealing with the CCTA are:
 - CCTA is advisory only.
 - Lack of training in stating operational requirements and writing contracts.
 - Constantly changing requirements for custom software development projects and the habit of abandoning contracts.
 - An attempt to divide the solution. The division of a large project into several stages, each put out to competitive tender.
 - A key difficulty in government contracting is a lack of understanding of precise requirements.
- Nevertheless, despite these problems there appears to be an awareness in the Civil Service that a move towards the placement of SI contracts is inevitable because of the key problems of:



- Obtaining the key staff resources.
- The increasing complexity of systems.
- The lack of trained project managers.
- The need to impose accountability.
- The extremely large number of suppliers of computer system products.
- It must also be recognised that in moving towards outside contracting further resistance from the Civil Service unions will occur.
- Civil Service bidding procedures include:
 - An initial tendering phase which may occasionally be partly funded.
 - A negotiation phase which results in a memorandum of agreement being issued to the lowest-cost bidder (technical compliancy having been established).

b. Projects

- Exhibit III-15 provides examples of the major projects in the civil government area that are currently known. These are referenced below.
- The Government Data Network (GDN) project will link four main Whitehall departments and at \$300 million is one of the most prestigious public computerisation projects in the U.K. However, fears have been raised over its cost, scale, and the potential for its misuse.
- A final decision on the successful contractor is expected in autumn.



EXHIBIT III-15

U.K. CENTRAL GOVERNMENT

PROJECT	(\$Millions)
GDN (Government Data Network)	300
LOP (Local Office Project for DHSS)	1,050
PIMIS (Home Office Passport Project)	30
FOLIOS (Foreign and Commonwealth Office Secure Office Automation System)	15
PAYE	13.5



- The CCTA is orchestrating this project, which is a shared data network linking four major government departments:
 - The DHSS.
 - Inland revenue.
 - Customs and excise.
 - Home office.
- The data communications network will use X25 protocols with OSI standards. The contract will cover both systems integration and facilities management.
- The project has been estimated at costing in total anything from \$300-600 million over a period of eight years.
- Initially, five groups (consortia) were selected to make proposals:
 - Plessey/CAP.
 - Racal/Scicon.
 - ICL/Cable and Wireless.
 - EDS/Northern Telecom.
 - British Telecom/CSC.
- EDS/Northern Telecom dropped out of the bidding of their own volition following bad publicity about EDS's attempts to get staff into the U.K. without correct work permit documentation.



- The Plessey/CAP consortia was subsequently removed from the short list because 'it had not got a network or experience of running a network'.
- Plessey-CAP had stressed the British content of its management team. Its technology was to come from Telenet Communications under a 'teaming agreement'.
- It is estimated that the five original bidders have spent up to \$300,000 each on their bids to date. The remaining three can expect to spend \$1.5 million each on their final bids including investment in hardware.
- The Local Office Project (LOP) for the DHSS is a \$1,050 million project. Contracts and agreements already made for this project include:
 - At least \$375 million to ICL for computer hardware systems.
 - British Telecom for \$78 million (BT has subcontracted a supply of terminals and printers to Newbury Data Recording).
- The project is planned for an implementation period of ten years.
- The PIMIS (Home Office Passport Project) is a \$30 million project that EDS bid very strongly for. Following their exposure in trying to bring staff into the country illegally, the contract was awarded to Software Sciences.
- The Foreign and Commonwealth Office Secure Office Automation System (FOLIOS) is a \$15 million project, the majority of which is understood to be for hardware. It is not clear to what extent external project management will be used for this development.
- The PAYE (Pay As You Earn - Income Tax) system is a situation where the government will act as its own prime contractor. CSC has been awarded a systems integration contract with ICL (computer hardware) and Plessey



(communications) as subcontractors. CSC is to act in conjunction with government staff. The project is phased:

- Phase 1 is worth \$4.5 million over four years.
- Phase 2 is worth \$9 million over five years.

c. Market Size

- Exhibit III-16 shows an analysis, produced by the CCTA, of the U.K. civil government's pattern of expenditure on external computer services. The U.K. fiscal year runs to April 5 each year.
- The planned increase in expenditures for facilities management and systems integration is notable.
- In total, the government spends over \$1.5 billion on computer systems of which approximately one-half is spent on software development.
- Exhibit III-17 shows the estimated year-by-year revenue generation of the (above \$5 million contract) SI civil government market sector.
- Given some of the difficulties being anticipated in this sector and the relative size of the LOP project in comparison with the other projects, no further projects have been assumed in formulating the market size estimate shown in Exhibit III-17.
- No evidence of SI business in the \$1 million to \$5 million contract value range was identified. It is, however, estimated that contracts in this category will be granted and could be worth conservatively \$15 million per annum by 1991.



EXHIBIT III-16

U.K. GOVERNMENT COMPUTER SERVICES
PURCHASING PLANS

TYPE OF SERVICE	£Millions		
	1985-1986	1986-1987	1987-1988
Consultancy	50	75	110
Software Development Contracts	40	60	90
Bureau	15	18	20
FM/SI	-	20	40
Total	105	173	260



EXHIBIT III-17

U.K. CIVIL GOVERNMENT: CONSTITUENT PROJECTS

PROJECT (Value \$Millions)	1986	1987	1988	1989	1990	1991	1992	1993	1994
GDN (300)	-	-	10	30	50	50	40	40	40
LOP (1,050)	20	40	60	100	130	150	150	150	140
PIMIS (30)	-	2	8	12	8	-	-	-	-
PAYE (13)	-	1	3	3	3	2	1	-	-
Subtotal	20	43	81	145	191	202	191	190	180
Other Projects	-	-	-	-	-	-	10- 30	20- 40	30- 50
Total (Rounded)	20	40	80	145	190	200	210	220	220



5. U.K. MANUFACTURING/ENGINEERING

a. General

- This sector is defined as including both discrete manufacturing (including engineering) and process manufacturing (including electronics).
- In the U.K., the government has made awareness of advanced manufacturing techniques a pillar of its 'information technology' policy and, therefore, an environment of high awareness exists concerning the application of computer systems to the individual process.
- The government has estimated that in 1986 some \$3 billion was spent on manufacturing systems compared to \$1,350 million in 1985.
- For example, the DTI has invested \$1.5 million in an information centre for companies seeking independent advice called COMCENTRE and managed by the Production Engineering Research Association.
- U.K. manufacturing is currently reflecting a very buoyant attitude with some indication of a revival in capital spending, expected to rise by about 3.5-4.5% in 1987.
- In general, INPUT's research indicates that the levels of expenditure on computer systems development remain relatively modest in the manufacturing/engineering sector.
- As can be seen from the examples cited below in subsection b., it is not untypical for \$0.5-1.0 million to be the amount expended on the software and system development aspects of a factory investment.
- Process plant monitoring and materials handling systems have emerged as significant opportunities for systems houses in the U.K. marketplace. Systems Designers and CAP, for example, are both active in this sector.



b. Projects

- Examples of some significant projects in the U.K. manufacturing/engineering sector are shown in Exhibit III-18.
- The Rolls Royce project won by GDS at an estimated total contract size of \$40 million is notable as perhaps the largest contract of its type identified to date.
 - INPUT believes that the expenditure by Rolls Royce is exceptional, not within its own industry on a world scale, but in comparison with manufacturing industry in general.
 - Rolls Royce has placed increasing emphasis on investment in research and engine demonstrator programmes prior to full engine development.
 - The company claims that investment in computing has led to a 50% reduction in their R&D costs over the past ten years. Rolls Royce is planning to cut this by a further 30% by 1990.
 - Rolls Royce has released some information about what it spent on advanced engineering to prove technology in advance. Whilst this represented 15% of total R&D spent in 1980, it had risen to 25% by 1985. It is further expected to increase to about one-third by 1990.
 - U.K. government support for these programmes has risen from about \$18 million in 1982 to \$66 million in 1985.
- Mobil has made a \$10 million investment in a lubricants blending plant. This is a joint venture between Mowlem Engineering and B.T. Rolatruc.
 - The project involves the upgrading of the materials handling system and warehouse system to automate the movement of packaged



EXHIBIT III-18

U.K. MANUFACTURING/ENGINEERING

PROJECT	(\$Millions)
Rolls Royce (Engine Testing System)	40
Mobil (Lubricants Blending Plant)	10
Shell Lubricants	10
Heinz	10
Yamazaki	3
Bally Burkett	5-6
Hattersley Newman Hender	7
Jaguar (Genrad)	13
BP Oil	5
Red Bank Manufacturing	3
Black and Decker	9
Jaguar (Comau)	75
Jaguar (Carl Schenck)	12



products. It will be under the control of a central warehouse management computer and is scheduled for operation by the last quarter of 1988.

- Shell has signed a \$7.5 million contract with CAP for computerised control of an oil blending complex. HP computers are being used for automatic blending, weighing, filling, and operations including guided vehicles and stacker cranes.
- Heinz has spent approximately \$10 million on a process plant monitoring project. Systems Designers were subcontractors for the system development work.
- The \$52 million development of the Yamazaki machine tool plant at Worcester (England) includes buildings and machine tools. The SI content of this contract has been estimated at \$3 million.
- Bailey Burkett a subsidiary of Imperial Metal Industries (IMI) has invested over \$5 million in a computerised design and manufacturing system. It is interesting to note that this company has annual revenue of about \$15 million.
- Hattersley Newman Hender is a \$7.5 million investment which includes KTM (a subsidiary of Vickers) computerised machining centres. Siemens provided the supervisory computers and automated guided vehicles were provided by Wagner (West Germany).
- Jaguar Cars has invested in test systems from Gen Rad Inc--a \$13 million contract for diagnostic and fault location systems for the XJ6. Logica has also gained smaller contracts for system development concerned with test systems.
- BP Oil at Hamble Terminal has awarded a \$4.5 million contract for engineering design, procurement, and construction management services to Mathew Hall Engineering. The work incorporates sophisticated



microprocessor control and modifications to site entrances and roadways. The contract was awarded in February 1987.

- Jaguar is also planning a \$75 million investment with Comau for robotic body assembly lines and has announced a \$12 million contract with Carl Schenck for 24 engine test cells.
- Red Bank Manufacturing Company has embarked on a \$3 million scheme including a computerised gas-fired tunnel kiln. Contracts have been signed with Paris-based kiln specialist CERIC and civil engineering contractor C. Percy Trentham.
- Black & Decker awarded a \$9 million contract to the civil engineering company IDC Ltd. for a warehouse system to include Dexion materials handling equipment (June 1985). This project involved a subcontract to CAP for software development which was the largest of ten contracts received up to that time by CAP from Dexion. The system is based on 2 PDP 11/73 computers.
- In June 1986, CAP obtained a contract with ICL, Computer Automation, and MATOR Systems Ltd. for BICC (value unknown).
- Some other contracts in this sector are:
 - Ford U.K. Research Engineering Centre for computerised testing of automotive components from Logica.
 - Plessey-Evershed Robotics—a \$300,000 contract to supply a Toshiba robotised assembly line.
- It is also interesting to note that Rolls Royce have announced the purchase of Computervision CAD/CAM equipment valued at \$40 million.



- Most other automation projects in the manufacturing sector are relatively small; for example:
 - A \$500,000 contract to Istel Automation for a computer-based 'flowline' control system for a Philips portable radio production line. The system will use computers linked by a network to control production from receipt of order to dispatch.
 - Reckitt and Colman for installing a radio-linked computer-controlled warehouse operation system. The equipment is designed and installed by Process Computing of Harlesden.
 - A \$750,000 contract to CAP from Beloit Walmsley in June 1985 for an automated shop floor data collection system based on VAX 11/750.
 - A \$450,000 contract with Jungheinrich for a VAX 11/750-based computerised stores control system for Batchelor's Foods.
 - A \$300,000 contract from British Steel to Brown Boveri for a P4000 distributed process control system.

c. Market Size

- Exhibit III-19 shows the constituent projects and the formulation of the market size estimates for the U.K. manufacturing/engineering sector.
- Quite evidently, the GDS Rolls Royce project at \$40 million has an overwhelming influence on the estimated growth of this market. This exhibit shows the constituents of an estimated market of \$15 million in total in 1986 growing to an estimated \$40 million by 1991, an annual average growth rate of about 22%.



EXHIBIT III-19

U.K. MANUFACTURING/ENGINEERING: CONSTITUENT PROJECTS

PROJECT (Value \$Millions)	1986	1987	1988	1989	1990	1991	1992	1993	1994
Rolls Royce (40)	-	5	12	8	8	4	2	1	-
Baily Burkett (5)	1	-	-	-	-	-	-	-	-
Hattersley Newman Hender (7)	3	-	-	-	-	-	-	-	-
Jaguar (Genrad) (13)	6	-	-	-	-	-	-	-	-
Jaguar (Comau)	-	5	5	-	-	-	-	-	-
Jaguar (Carl Schenck) (12)	-	2	8	2	-	-	-	-	-
Subtotal	10	12	25	10	8	4	2	1	-
Other Projects	5-10	5-10	5-15	5-25	10- 25	35- 40	NE	NE	NE
Total (Rounded)	15	20	25	30	35	40	NE	NE	NE

NE = Not Estimated



- In addition to this market forecast for the greater than \$5 million contract sector, INPUT further estimates that there will be an adjacent below \$5 million contract sector that is likely to reach \$30 million by 1991, growing at an AAGR of about 25% from a \$10 million market size in 1986.

6. U.K. BANKING AND FINANCE

a. General

- Organisations that are included in this market sector are:
 - Banks.
 - Credit institutions.
 - Investment institutions.
 - Auxiliary finance and banking services (stockbrokers/dealers).
 - Insurance companies.
- Systems integration to date is not a widely accepted concept in this market sector. The development of CHAPS (a large development contract placed with ICL in 1982) is perhaps the only example of a major project put out to external development.
- CHAPS was a special situation since it concerned a joint system shared and funded by the major clearing banks for interbank payment clearance.
- The most significant event over the past 12 months has been the deregulation of the London Stock Exchange, the so-called Big Bang of October 1986.



- The Financial Services Act of 1986 that liberalised the building societies (savings and loan organisations), allowing them to compete directly with the high street banks, has also been significant in introducing a greater degree of competitiveness into the financial scene.
- Building societies now offer current accounts with cheque guarantee cards plus money transmission and foreign exchange services. They can now lend money not secured on houses.
- Currently, the major British banks are extremely profitable:
 - National Westminster raised pretax profits by 26% to more than 1 billion pounds in the last year.
 - Lloyds raised pretax profits by 25% to 700 million pounds.
 - Midland raised pretax profits by 24% to 434 million pounds.
 - Barclays raised pretax profits by 7% to 895 million pounds.
- However, all four of these banks face harder times. The new legal environment and the obvious high profitability of their current operations are luring competitors into the domestic deposit and loan market.
- The key concept for banking systems of the future is communications. By the end of 1986 it is estimated that approximately one-half of all financial institutions had installed their own data communications networks and that a further 30% will install their own data networks within the next three years.



b. Projects

- Key areas of activity for computer system development in this market sector are:
 - Dealing room systems.
 - Back office and front office systems (branches).
 - Banking systems and communications.
 - EFT/POS systems.
- Dealing Room Systems, although involving a considerable degree of systems integration, are generally worth \$1.5 million or less for the computer system part, but some have been as large as \$9 million total investment. Construction companies are usually the lead project manager. The installation period is generally in the range of three months to one year.
- In the U.K. there are estimated to be about 30 companies that are active in the 'dealer room' market. The major vendors are:
 - Reuters (Rich and IP Sharp).
 - Datalogic (Raytheon).
 - Micrognosis (CDC).
 - CAP.
 - SD.
 - Logica.



- CCF.
- Some examples of contracts for dealing room systems are:
 - Mitsubishi Bank bought a VAX-based system from CAP Financial Services.
 - James Capel installed a 100-seat system from Alphanumeric.
- Further expansion in this subsector is expected, particularly from the life assurance market.
- Another factor which is likely to lead to increased systems development is the replacement of systems hurriedly installed to meet the 'big bang' development that is now considered inadequate.
- As a result of high current profitability and competitive threats, the clearing banks are committed to relatively large expenditures on computer systems.
- Some examples are:
 - Midland Bank forecasting that they will need 3,900 mips of processing power by 1990. They expect computer system expenditures to at least exceed \$380 million over the next five years.
 - Barclays Bank projecting a need for a database of at least six terabytes (6,000 G bytes) and a compound growth of 45% per year in processing power. Barclays anticipates a five-year spend of \$600 million.
 - National Westminster Bank expects to spend in the order of \$1.5 billion over the next five years. Fifty percent of this is estimated to be for computer hardware.



- Lloyds Bank has announced a branch information technology project that is expected to involve expenditures of \$1,275 million to update all the bank's technology systems. This includes:
 - Replacement of IBM 3600 terminals by some 28,000 new processors and terminals.
 - Unisys, NCR, and Infotron hardware.
 - An integrated voice and data network using digital transmission techniques with systems from both BT and Mercury.
- All of the four majors are heavily committed to IBM with MVS/X4 as the main operating system.
- Lloyds is spending \$15 million on developing its international system which will be using ADR's Datacom/DB relational database.
- The investment being made in cashless shopping (EFT/POS) should also be noted, e.g., the Lloyds pilot scheme in Peterborough using:
 - Fortronic terminals.
 - Lloyds Tandem computing centre.
 - CAP Base 24 enabling software.
- LINK is a possible project to connect together the central DP systems of the major clearing banks so they can transfer payments between their central DP systems.
- Stage one is likely to be reciprocity between cash dispensers.



- The hardware is likely to be Tandem-based, which is thought to have become the de facto standard to provide the links between the computer systems of the different banks. The Midland bank has already invested \$22 million in Tandem Non-Stop TXP and VLX processors.
- LINK is clearly a potential SI contract and could be worth \$20-30 million.
- The National Westminster Bank has awarded a \$3 million contract to Thorn EMI Protech to establish a new branch security communications monitoring system. This will use the bank's computer network to route alarm signals from branches and cash dispensers into a 24-hour manned central communications station.
- In 1985 the National Westminster Bank also commenced a three- to four-year project for the development of a packet-switched network with 2,000 nodes. This represented an investment of \$30 million, but systems design and project management were handled in-house.
- The National Westminster Bank is also known to have a major communications network project at the planning stage. Logica has been awarded a \$4 million design contract for this. The total project size is estimated to be at least \$100 million.
- The Trustee Savings Bank (TSB) is known to be spending about \$7 million on a development to link over 1,000 ATMs to the joint Midland/National Westminster network. Project management is in-house.
- The National and Provincial Building Society has spent \$13 million on a Unisys A14 computer system and the first Burroughs/Plessey-linked office automation network. The systems share 20 Gbytes of disk memory and provide backup and disaster recovery facilities.



- Another example of the kind of large projects that are being developed in this sector is that of the Abbey National Building Society (the U.K.'s second largest savings and loan institution). However, it is being managed in-house.
- The Abbey National is currently implementing a major ATM network with the following characteristics:
 - 4,000 Olivetti terminals.
 - 300 NCR ATM's.
 - 250 Sperry terminals.
 - 1,000 modems (50 Timeplex).
- This equipment is controlled across 700 branches and 3 major computer centres. Up-time requirement on the network is 98.5%.

c. Market Size

- The formulation of the market size estimate for the U.K. banking and finance sector has been approached as follows.
- Exhibit III-20 depicts INPUT's estimation of what the U.K.'s banking and finance sectors will spend on computer-based systems in total over the next five years.
- From the estimates of gross expenditure on information technology projects provided by the four top clearing banks, it can be seen that their total expenditure over the next five years is estimated to be \$3.25 billion or an average of \$650 million per year.



EXHIBIT III-20

**U.K. BANKING AND FINANCE SECTOR
COMPUTER-BASED SYSTEM EXPENDITURE**

ESTIMATED TOTAL EXPENDITURE	\$ MILLIONS					
	1986	1987	1988	1989	1990	1991
Top Four Banks	380	450	550	650	750	850
Other Banks	380	450	550	650	750	850
Building Societies	130	150	200	250	300	300
Insurance Sector	500	600	700	800	900	1,000
Dealing Rooms	150	170	200	230	260	300
Other	200	250	300	350	400	450
Subtotal	1,740	2,070	2,500	2,930	3,360	3,750
Total (Rounded)	1,700	2,100	2,500	2,900	3,400	3,800



- All other banks are estimated to spend at least as much as the top four, and building societies will be developing their expenditures to the level of at least \$300 million per annum by 1991.
- The insurance sector and other financial institutions will also account for substantial volumes of expenditure of which specifically 'dealing systems' will be a substantial proportion.
- The U.K. market for dealing room systems is estimated as having achieved a level of \$150 million in 1986 and is expected to continue to grow at around 15% per annum. Reuters is estimated to have a market share of between 50-60%.
- It is estimated that only \$10 million of this represented business generated from projects whose total contract value exceeded \$5 million. It has been assumed that this part of the market will grow at 15% per annum in line with overall growth.
- In summary, it can therefore be seen from Exhibit III-20 that the total expenditure on computer-based systems is expected to grow from \$1.7 billion in 1986 to about \$3.8 billion by 1991.
- Although the expenditure on computer-based system development including software is clearly very large in this sector, there is little evidence to suggest confidently at this stage that much of it will be spent through SI-type contracts.
- There clearly exists an opportunity for vendors to attempt to gain considerable SI business in this market. The highly competitive nature of this business and the need for confidentiality is likely to leave SI contractors only being able to bid for the less 'critical' system development aspects of these developments.



- INPUT has thus formulated a very conservative forecast for this market, as is shown in Exhibit III-21. This exhibit shows the development of INPUT's forecast for the above \$5 million contract sector of the market.
- INPUT considers that SI-type contracts in the lower than \$5 million sector will represent a much larger market in this market segment, some \$90 million in 1986, growing to \$200 million by 1991. This market is fundamentally considered to consist of 'dealing room' system contracts.
- Again, it should be noted that the opportunity exists for this market to be considerably larger than forecast, but will be dependent not only on aggressive marketing by vendors but by a strong change of attitude amongst the buyers.

7. OTHER U.K. MARKET SECTORS

- This section groups, purely for convenience, all other sectors of the market not separately identified above. Those sectors of the economy whose potential SI projects have been identified include:
 - Telecommunications.
 - Public services.
 - Post office.
 - Police and fire services.
 - Health.
 - Utilities, including nuclear power.
 - Retail and distribution.



EXHIBIT III-21

U.K. BANKING AND FINANCE: CONSTITUENT PROJECTS

PROJECT (Value \$Millions)	1986	1987	1988	1989	1990	1991	1992	1993	1994
Dealing Room Systems (Total Subsector)	10	11	13	15	17	20	NE	NE	NE
Link (25)	-	5	10	8	2	-	-	-	-
Lloyds Inter- national (15)	-	3	5	5	2	-	-	-	-
National West Communications Network (100)	-	1	3	10	20	30	20	15	-
Other Projects (est.)	-	-	-	-	5	20	40	60	80
Subtotal	10	20	31	38	46	70	NE	NE	NE
Realism	90%	70%	50%	50%	50%	60%	-	-	-
Market Estimate	10	15	20	25	30	35	NE	NE	NE

NE = Not Estimated



a. Telecommunications

- This sector in the U.K. only concerns British Telecom, Mercury (a subsidiary of Cable and Wireless), and the City of Kingston-upon-Hull as the only licensed bearer services.
- British Telecom has the vast majority of the market (over 90%), Mercury is a new start-up resulting from liberalisation of telecommunications in the U.K., and the City of Kingston-upon-Hull offers a service in its own geographic area resulting from an historical quirk.
- There is considerable investment being made in both new telecommunications and internal computer-based systems. There is little evidence that major projects are being contracted out to independent vendors.
- Indeed, British Telecom itself is acting as a vendor of SI projects in other markets already referred to in previous sections.
- The most significant planned investment by BT for administrative computing is their Customer Service System (CSS). This is a major upgrading of their internal MIS systems and has a projected expenditure value of \$300 million.
- However, this project has been managed in-house and is an example of a very large project which has run into considerable implementation difficulties.
- Currently, BT has frozen implementation whilst it rethinks its approach. Part of the reason is the need to change the administrative structure of BT, and this clearly has a strong effect on the systems structure.
- BT appears to be attempting more overall coordination of its computing functions and is bringing in Dr. John Spackman, who previously has been leading the \$1 billion DHSS computerisation project.



- Some other examples of contracts that are being placed by BT are described below.
 - A follow-on contract worth \$13 million has been awarded to Plessey Network and Office Systems by BT to supply, install, and commission the electronics for a U.K. operations management system.
 - BT International has awarded a \$12 million contract to STC/ICL to develop, supply, and install automatic circuit systems to manage the connection of international digital voice and data circuits.
 - BT has contracted Hewlett-Packard to supply specialised remote access and test equipment (RATES). This is the third part of a four-year programme worth more than \$22 million.
 - BT has given Marconi Communications Systems a \$6 million order to expand its Kilo Stream leased line data network. The order is to supply Automatic Cross-connection Equipment (ACE) and to expand the system currently installed.

b. Public Services

(i) Post Office

- The U.K. Post Office is planning a major computerisation of its 22,000 strong branch network. Post offices deal with a very wide range of administrative duties including car licenses and social security payments.
- The complete project is likely to cost at least \$600 million, and the first of \$200 million was approved during 1986. This will enable initial development in 250 branches for the Thames Valley by 1988.



- The overall project management contract is being bid for by ICL (bidding Stratus machines) and Software Sciences (bidding Tandem).
- For the X25 network contract ICL is bidding with Telematics, and Racal/Milgo and Plessey are also bidding.
- The terminals bidders are Fortronic, Unisys, NCR, and Nixdorf.
- Each of the two main contract bidders (ICL and Software Sciences) has to choose partners from amongst the contending subcontractors.
- During the writing of this report (April 1987), the announcement was made that Software Sciences had been selected by the post office to develop the pilot project.

(ii) Police and Fire Services

- The potential in this sector of the market is basically concerned with C³I systems, although these are back office projects in the police area.
- The geographical split of responsibilities of these services implies relatively small projects in general. Some examples of projects in this market are described below.
 - An order in excess of \$4 million has been placed by the West Yorkshire Police with McDonnell Douglas and Isis Computer Services for the development and implementation of a crime information system.
 - The Metropolitan Police are currently at the bid stage for a \$22 million C³I project which is the first of a three-stage programme.
 - The Metropolitan Police are also implementing a \$9 million Crime Reporting Information System (CRIS). CAP, SD, and Datalogic have



been shortlisted. Contenders rejected to date include Honeywell, EDS, Unisys, and an SSL/ICL joint venture. CAP is bidding an IBM 3090 system and S36s, SD is basing its system on DEC VAX and Microva kit, and Datalogic's bid is with Siemens.

- The Thames Valley Police are currently (at the time of writing) in the final stages of developing specifications for a \$2 million command and control system project. Honeywell, Unisys, and McDonnell Douglas are believed to be key contenders for this business.
- Bedfordshire police placed a \$500,000 order with Honeywell in 1986 for the first phase of a seven-year plan to install local and wide area networks for communications within the force.
- The Police National Computer Unit (PNCU) is a major computer system for development of police projects (e.g., fingerprinting data banks) on a national scale. Currently, it is a Unisys account, but it is thought that with an increasing need for a wide range of kit from different manufacturers that Unisys may be at risk in this account.
 - Logica has been called in by the PNCU to help draft future requirements.
- CGS has installed a C³I system for the South Yorkshire Police, West Mercia Police, Cleveland, and Sussex police forces. Contract values are estimated to be around \$1 million each.
- CGS has also obtained a \$5 million order for a C³I system for Strathclyde Fire Brigade.



(iii) Health

- This is a market area which shows some potential since some contracts have been given to independent vendors that could be classified as SI.
- The U.K. government has also projected that expenditure on computer-based systems is expected to total \$1,500 million over the next ten years. It should, however, also be recognised that the health service faces considerable pressures on its expenditures in general and this could well impact the money spent on computer-based systems, albeit that they are designed to reduce costs.
- EDS won a system development contract estimated to be worth about \$3 million from BUPA, a private medical insurance service.
- The Wessex Hospital Authority recently awarded a system development contract to Arthur Andersen worth approximately \$1.5 million, alongside a separate substantial hardware order to IBM.
- Some controversy was incurred over the way this contract was awarded, since Arthur Andersen was also involved in an independent capacity to consult on the choice of software. Both ICL and Digital complained about the decision-making process to the DHSS.
- The North West Thames Regional Health Authority is spending \$5 million on McDonnell Douglas software and Digital hardware for pathology and radiology in seven of its district hospitals. It is believed that the contract was won in competition with Ferranti and ITL.

c. Utilities

- This area could potentially offer a number of SI opportunities, particularly in relation to new investment in nuclear power plants and control of power transmission, gas pipelines, etc.



- The CEBG has placed a multimillion dollar contract with Solatron Investments for the supply, installation, and commissioning of a major data acquisition and processing system at DRAX power station. The contract is believed to be worth approximately \$5 million.
- The go-ahead has recently been given for the Sizewell nuclear power station which in total is a \$2.4 billion project. The initial batch of contracts worth \$180 million has already been let. These are for the design work, computer software, and forgings for the pressure vessels.
- Westinghouse, the license source for the PWR reactor, is the prime contractor for the \$210 million 'nuclear circuit'; most subcontractors are expected to be British companies.
- Systems Designers has obtained contracts in this market sector, notably a \$2.5 million contract for British Nuclear Fuels connected with materials handling systems.
- Systems Designers has also done work for the CEBG in connection with the upgrading of the U.K.'s electrical power distribution grid.
- Logica has also obtained contracts in this sector in the area of the monitoring and control of oil and gas pipelines and systems. Logica has done work for the U.K. National Gas Transmission Network and has provided a telemetry system for the Anglian Water Authorities Water Distribution System.

d. Retail and Distribution

- This sector is considered to offer some potential for SI contracts because of the competitive advantage pressures to invest in computer-based systems for materials handling and point-of-sale systems.



- It can be expected that over the next several years leading retailers will be placing considerable emphasis on the integration of the various computer applications, e.g., inventory control, point-of-sale (POS), and purchase order applications.
- However, little evidence of substantial third-party contracts has been uncovered. The following examples have, however, been identified:
 - Software Sciences offers an enabling product, Merchant 38 (based on a System 38), and its sister company, Thorn EMI Micrologic, provides EPOS terminals. Software Sciences has won a systems integration contract to Reliable Hosing Ltd. to equip its 58 retail stores with a system based on these components.
 - Thorn EMI Micrologic has obtained a \$4 million contract to provide an EPOS terminal system for a tyre retailer (ATS).
 - The Sears Group is using Logica's ON/2 application system, running on IBM equipment. The contract is worth over \$5 million.
 - Texas Homecare, a DIY retailer, has used a consultancy, Inforem, to select appropriate systems for its in-store developments which are estimated to be costing several million dollars. To date, all implementation has been in-house.

e. Market Size

- Exhibit III-22 shows INPUT's formulation of the estimated market size and growth for the U.K. 'all other' sector for projects greater than \$5 million in value.
- Since the project analysis is dominated by one very large project, the office automation system for the post office, it seems reasonable to apply a fairly high realism factor.



EXHIBIT III-22

U.K. 'ALL OTHER': CONSTITUENT PROJECTS

PROJECT	VALUE (\$ MILLIONS)	1986	1987	1988	1989	1990	1991	1992	1993	1994
BT OPERATIONS MANAGEMENT	13	4	6	3	-	-	-	-	-	-
BT RATES PROJECT	22	5	5	5	-	-	-	-	-	-
POST OFFICE	600	-	10	60	60	80	80	80	80	80
METROPOLITAN POLICE										
-C3I	22	-	-	3	5	10	4	-	-	-
-CRIS	9	-	-	2	5	2	-	-	-	-
PNCU	30	-	-	-	3	5	12	8	2	-
NUCLEAR POWER PROJECTS	40	-	-	5	10	10	10	5	-	-
OTHER PROJECTS (est.)		1	5	10	15	20	30	40	50	60
SUBTOTAL		10	26	88	98	127	136	133	132	140
REALISM		100%	80%	50%	50%	50%	60%	NE	NE	NE
ROUNDED TOTAL		10	25	45	50	60	75	NE	NE	NE

NE = Not Estimated

YGRU



- Consequently, INPUT forecasts a growth from \$10 million in 1986 to a \$75 million market in 1991, representing annual average growth of 50%.
- In addition, INPUT forecasts that there will be an adjacent below \$5 million contract value market that will grow from \$30 million in 1986 to around \$70 million in 1991, representing annual average growth of just under 20% per annum.

8. WEST GERMANY

a. General

- In comparison to the U.K. market, and given the much larger size of the West German economy, the information services business as a whole is relatively underdeveloped.
- The general attitude amongst West German companies has tended to be an 'anti-service' approach for data processing systems.
- However, the dominating position of the West German manufacturing base in particular and the presence of the same generic trends leading the demand for more and more automation are likely to mean a significant opportunity for systems integration to develop over the next few years in West Germany.
- The more advanced German companies will move through from the purchase from manufacturers to the purchase from integrators.
- It is interesting to note that the term systems integration is being used by service vendors in West Germany, albeit that they view it as the continued development of the market from large one-off turnkey projects and other substantial fixed-price contracts.



- The need for systems integration is also driven to some extent by the desire of the organisation not to contract directly with the computer manufacturer because of their internal equipment prejudice.
- This is a particular consideration for the West German Ministry of Defence.
- One special feature of the West German market of note is the existence of a large number of very specialised (and small--20-30 people) engineering consultants who have a worldwide reputation in their respective fields.
- These organisations may well play a significant role in the development of the SI market in West Germany.
- It is generally considered that the West German market represents a difficult market for U.K.-based contractors. Understanding the West German mentality in business, having a local presence, and speaking the language would all be very significant considerations.
- In this context it is interesting to note that EDS, outside these Adam Opel (GM) contracts, does not have any other business currently in this market.
- On the other hand, it should also be noted that IBM, which is very dominant in the West German computer market, employs 100,000 people in West Germany and to all intents and purposes is considered a German company.
- Hughes Aircraft also appears to have a considerable presence in West Germany.
- U.K.-based vendors tend to view the West German market as one of considerable opportunity (in total contradiction to the French market). One vendor actually commented that West Germany was 'a natural systems integration market'.



- The tendency for the German mentality to think 'in-house' paradoxically has made the West German market one of vast potential.

b. Projects

- Both the West German MOD and the Deutsche Bundespost (DBP) have placed large SI-type contracts. West Germany, as a member of NATO, will have similar projects to those described for the U.K. MOD; for example, a \$75 million project for German Air Defence is known to have been placed.
- The project to develop a Bildschirmtext (a public videotex system) was given by the DBP to IBM; its total value was of the order of \$200 million. This project, recognised internally within IBM as a major SI project, was seriously behind schedule and over budget in its implementation.
- The DBP has recently placed a \$10 million contract with Northern Telecom for additional SL-10 data packet systems as part of the overall Datex-P implementation.
- An example of an SI project within the oil industry was a \$10 million automation modernisation project for a Deutsche Shell refinery. Of this total contract, some 55% was for computer hardware and systems.
- In the manufacturing sector Robert Bosch in one project made a \$5 million investment in a flexible manufacturing system. However, only some 5.6% of this investment related to computer system development.
- Rheinmetal developed a special laboratory to test and simulate the performance of rockets. This \$10 million project was completed in 1986. Some 40% of this was expended on software development.
- SCS, the West German subsidiary of Scicon (the BP systems affiliate), has worked extensively as a subcontractor on warehousing projects with such



companies as MAN, DEMAG, and MANNESMAN. This work is analogous to that obtained by CAP in the U.K. with DEXION.

c. Market Size

- INPUT's estimate of the West German SI market is shown in Exhibit III-23.
 - The analysis of the greater than \$15 million contract market shows that in total INPUT estimates that the West German market will grow at about 60% per annum on average from \$40 million in 1986 to around \$460 million in 1991.
 - The adjacent below \$5 million contract value SI market is estimated by INPUT to grow at around 35% per annum from \$50 million in 1986 to \$230 million in 1991.
9. ITALY

a. General

- In general, the Italian market is the most difficult of the major European country markets to evaluate. Its overall information services markets are the least developed of those of the major economies, but restructuring amongst significant Italian firms such as Olivetti and the state-owned telecommunications companies are some grounds for suggesting that significant developments, including SI business, could develop rapidly.
- Two features of the Italian market stand out as supportive to the emergence of SI markets both from the supply and demand directions:
 - Firstly, the presence of a very significant defence manufacturing industry.



EXHIBIT III-23

WEST GERMAN SI MARKET FORECAST

SECTOR	1986	1987	1988	1989	1990	1991
GREATER THAN \$5 MILLION						
DEFENCE	5	25	55	75	85	85
CIVIL GOVERNMENT	5	10	20	35	70	120
MANUFACTURING/ ENGINEERING	30	40	60	80	110	150
BANKING/ FINANCE	-	5	10	20	30	40
ALL OTHER	-	5	10	20	40	65
TOTAL	40	85	155	230	335	460
LESS THAN \$5 MILLION						
TOTAL	50	70	95	125	170	230
TOTAL MARKET (Rounded)	90	150	250	350	500	690



- Secondly, the highly interrelated and integrated nature of Italian business, an extremely large proportion of which is controlled by the government through its state-holding company IRI.
- The Italian defence industry is the sixth largest in the world in terms of arms exports after the U.S., the Soviet Union, France, the U.K., and West Germany.
- Italy exports about 60% of its defence industries' output compared with about 35% in the cases of both France and the U.K.
- The Initiative for Industrial Reconstruction (IRI) was originally set up in 1933 to assist in restoring health to the Italian banking system after the years of the Great Depression.
- The sheer size of the economic problems of that era resulted in IRI finding it impossible to return its extensive ownership of companies to the private sector. It, therefore, became a permanent institution.
- Today, IRI's coverage extends, amongst many other areas, to control of:
 - Eighty-two percent of Italian telecommunications traffic through Sip.
 - Fifty-five percent of all steel production through FINSIDER.
 - Fifty-five percent of the aerospace industry through Selenia and Aeritalia.
 - Fifty percent of telecommunications switching equipment manufactured through Italtel.
 - Ninety-eight percent of microelectronics manufactured through Sgs.



- In the last two years a key feature of the Italian market has been the development of numerous joint ownership companies, many with participation by U.S. corporations in line with the labyrinthine nature of Italian commercial arrangements.
- Some examples of these developments are:
 - Olivetti and EDS have formed SEVA, a company believed to be focusing on the application of data communications technology.
 - Digital and Fiat, through its COMAU subsidiary, have formed SESAM to exploit opportunities in the market for factory automation.
 - Honeywell and SIRTl have a joint venture in the area of building automation.
 - Enidata, the computer services arm of ENI, the state oil company, and Sligos, a major French computer services company have formed a company, Monetica, to develop business in the area of EFT.
 - IBM and Pirelli have a joint venture company called Boselli Sistemi, again in the business of building automation.

b. Projects

- Little evidence of contracts that could reasonably be classified as SI was uncovered in the Italian marketplace.
- Projects that were uncovered in the research included:
 - An \$8 million finance and banking system for Sofid which was largely implemented by Enidata; Sofid and Enidata are, however, wholly owned subsidiaries of ENI.



- A \$4 million office automation project for Alitalia. Implementation was 'in-house' controlled.
- A \$4 million office automation project for Esso Italia that was partly managed externally.
- CAP is known to have gained some business through a materials handling system for Benetton.

c. Market Size

- INPUT's estimate of the Italian market for SI is shown as Exhibit III-24, a market worth a total of \$455 million by 1991.
- The greater than \$5 million contracts sector accounts for \$320 million of this total having grown from an estimated \$5 million in 1986. This represents compound annual growth of around 130%.
- The less than \$5 million sector is expected to show growth of about 70% to reach \$135 million by 1991 from a 1986 level of \$10 million.

10. FRANCE

a. General

- The SI market in France seems ripe for development, but could be hampered by the desire to only use French companies for that work on the one hand and the failure of French vendors to fully grasp the opportunity on the other.
- Both users and vendors interviewed in France considered that the need increasingly existed to service larger projects and to use more outside help in implementing them.



EXHIBIT III-24

ITALIAN SI MARKET FORECAST

SECTOR	1986	1987	1988	1989	1990	1991
GREATER THAN \$5 MILLION						
DEFENCE	5	10	25	35	40	45
CIVIL GOVERNMENT	-	5	20	40	80	150
MANUFACTURING/ ENGINEERING	-	5	15	25	35	45
BANKING/ FINANCE	-	-	5	10	15	25
ALL OTHER	-	5	15	30	40	55
TOTAL	5	25	80	140	210	320
LESS THAN \$5 MILLION						
TOTAL	10	15	25	45	75	135
TOTAL MARKET	15	40	105	185	285	455



- Indeed, in general, the computer services market is the most developed in the whole of Europe, and the French services vendors are amongst the largest and strongest in Europe, notably CAP GEMINI SOGETI.
- It must be recognised that the French market presents a very particular challenge for foreign companies because of its chauvinistic culture.
- Logica, for example, was prevented by French law from buying a French services company because it did not already have a French subsidiary established. Thus, EDS was able to recently purchase SIP only because GM had existing established businesses in France.

b. Projects

- A number of projects have been identified within the French market which can be considered to fall within the broad definition of SI. They have not necessarily been defined as SI projects by the vendors concerned at the time.
- Exhibit III-25 lists some major examples.

c. Market Size

- Exhibit III-26 shows INPUT's estimate of the French SI market. A total market estimated at \$80 million in 1986, and as growing to \$680 million by 1991, an annual average growth rate of over 50%.
- The contract value greater than \$5 million sector is estimated at \$40 million in 1986 with a projected growth rate of about 60% per annum compounded to reach \$460 million by 1991.



EXHIBIT III-25

FRENCH MARKET - MAJOR PROJECTS

ANNUAIRE ELECTRONIQUE	\$200 MILLION
GSIT	\$30 MILLION
HOME OFFICE	\$3 MILLION
RHONE POULENC	\$2 MILLION
SAINT GOBAIN	\$6 MILLION



EXHIBIT III-26

FRENCH SI MARKET FORECAST

SECTOR	1986	1987	1988	1989	1990	1991
GREATER THAN \$5 MILLION						
DEFENCE	5	20	50	70	80	85
CIVIL GOVERNMENT	10	20	40	80	150	220
MANUFACTURING/ ENGINEERING	10	15	25	40	60	80
BANKING/ FINANCE	5	10	15	20	25	30
ALL OTHER	10	15	20	25	35	45
TOTAL	40	80	150	235	350	460
LESS THAN \$5 MILLION						
TOTAL	40	55	80	110	160	220
TOTAL MARKET	80	135	230	345	510	680



CHAPTER IV: EUROPEAN MARKET ENVIRONMENT

IV EUROPEAN MARKET ENVIRONMENT

- This chapter provides some background information relating to the systems integration market in Europe. This includes:
 - Development of the market.
 - Vendor attitudes.
 - User perspectives.

A. DEVELOPMENT OF THE SI MARKET IN EUROPE

- Just as the commercial SI market represents a relatively new phenomenon in the U.S., so is systems integration a relatively new concept for both the user and vendor communities in Europe.
- Clearly, its rate of development, as can be seen from the market data provided in Chapter III, varies greatly for the various country and vertical sector markets.
- In general, the less developed the computer services market, the less developed the SI market is likely to be.



- The dominance of the major U.S. computer hardware manufacturers (i.e., IBM, Digital, Unisys, etc.) of the European market for computer equipment ensures the relatively rapid transference of trends in the U.S. industry into Europe.
- Consequently, INPUT registered a relatively high awareness of the term systems integration, albeit that the market is still at a relatively immature stage.
- In general, the development of this market can be traced to the shifting priority to build up software expertise as solutions have become less hardware based. This has resulted in the creation of a new generation of integration engineers--engineers who can marry the skills of software and hardware into the systems of the future.

B. VENDOR ATTITUDES TOWARDS SI IN EUROPE

- The term systems integration is being increasingly used by vendors in Europe, in some cases just as an accommodation to the latest industry 'buzz phrase'.
- All the vendors interviewed by INPUT were actively using the term in their marketing. For example, CAP has a systems integration brochure.
- Some insights into viewpoints on systems integration can be gained from the following vendor quotes made to INPUT:
 - "We consider systems integration to be a somewhat artificial term. It emphasises the observable trend that integration is continuing at a greater pace. It is very difficult to draw a dividing line between a large systems development contract and a SI contract. It is more a question of dependency on subcontractors'.



- 'We believe we are a systems integrator, and we promote ourselves as such and have been for a number of years. We do not see systems integration having a dramatic takeoff; it is just a continuous development. Our role is to choose the most cost-effective use of technology that meets the client's need--the operative word is choice'.
- 'The company has classed itself for a number of years as a systems integrator. We define this as the process of bringing together the appropriate system components. We can build our own hardware when necessary through an associated company. The typical size of the project dealt with is in the range of \$1.5-9.0 million.'
- U.S. organisations like EDS and CSC were clearly active in attempting to exploit the European opportunities.
- EDS has staked out a strong position in Europe in marketing terms. Many would consider that EDS has done the most to create awareness of the term but to date has little to show for it in terms of contracts.
- In terms of market selection, vendors reflected the consensus that the 'enlightened organisations' should be sought out as sales prospects. SI would be bought by market-oriented rather than production-oriented companies.
- The more 'high tech' rather than 'low tech' involved in either the product or the process would be a further indicator of the likelihood of sales potential.

C. USER PERCEPTIONS OF THE SI MARKET

- The user research conducted by INPUT for GDS provided evidence of rising management awareness of systems integration and the underlying trends that were bringing this about.



- Exhibits IV-1 through IV-5 provide a series of write-ups that provide a background picture of the market as revealed in INPUT's research.
- A fairly clear picture emerges from this approach. That is, there are clearly evident generic driving forces that are leading organisations to adopt the systems integration solution over the medium term.
- In the short term there exists cultural, business environment, and other potential inhibitors that are likely to slow down its progress.
- Inhibiting forces in the European market include:
 - Unaggressive management not seeking to employ the latest technology whenever possible.
 - The lack of preparedness to hand over significant responsibility for computer systems to third-party organisations.
 - The inability of many commercial organisations to be able to define the administrative systems that they need.
 - Limited 'project manager' resources.
 - Nationalistic attitudes within the various European states implying use only of indigenous suppliers.



EXHIBIT IV-1

THE U.K. CIVIL SERVICE

- The Civil Service is facing increasing difficulty in meeting its software development needs. Principal reasons given for this are:
 - Retaining/obtaining key staff resources.
 - The increasing complexity of systems.
 - Lack of project management skills.
- There appears to be only two possible strategies available to alleviate the situation:
 - The increasing use of software development productivity tools.
 - The use of outside services.
- The Civil Service is increasingly active in pursuing both these strategies.
- To date, a considerable body of pure 'software development' contracts has been placed with outside contractors, but mixed success has been experienced. The major problems associated with this process have been:
 - Accurate meaningful project specification.
 - Remote project control.
 - Full adaptation to Civil Service procedures.
- Some key criteria for vendor selection for the Government are likely to include:
 - A track record in government work; an understanding of government procedures.
 - Familiarity with the system development methodologies and techniques used by government.
 - Local presence.
 - Political and security considerations.

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EXHIBIT IV-2

A LARGE U.K. MANUFACTURING GROUP

- This company was increasingly tending to limit its own in-house development of computer systems.
- However, on the administrative side this was largely manifested in an increased tendency to buy software products.
- For production/engineering systems, however, outside contractors were used. The comment made was:
 - 'There is no way we would develop these systems in-house. This is for reasons of cost, experience, and skill. It is hard enough getting an outside contractor to do it; for us, we would never be able to keep the people.'
- The company's overall aim is to get a solution, and, consequently, it is seeking the proposal with the best fit for this purpose. To get a solution, the company will go to whoever can provide it.
- The installation of new technology in a new plant was considered to be a very key aim of the company in order to ensure state of the art production processes.



EXHIBIT IV-3

A MAJOR U.K. CLEARING BANK

- This particular organisation was beginning to make use of outside contractors in some way, examples of this being:
 - A requirements specification project put out to a consultancy/professional services firm.
 - Contracting with a software vendor to customise, test, and install a major international banking system.
 - Delegating complete project responsibility to its own 100% owned, but independent, computer services company.
- This organisation was facing tremendous external competitive pressure, the result of which was that there existed many outstanding projects with very limited timescales within which to accomplish them.
- The organisation also recognised that it did not have the skills required for many of the planned 'non-core' technology developments; the key area here was telecommunications.
- It is also very conscious of the enormous drag factor of the maintenance of the existing systems.
- From a security standpoint, outside development could be used, but it would be necessary to retain operational control in-house.

EXHIBIT IV-4

A MAJOR GERMAN OIL COMPANY

- Between 70-80% of the in-house data-processing staff are taken up with maintenance and updating of existing systems in this organisation.
- The view was expressed that in general it make no sense to maintain staff permanently for project development since this would add disproportionately to the overall costs.
- This company stated that there was as increasing tendency to place process control as well as administrative applications with outside contractors.
- It considers it particularly important that it maintain an on going relationship with the outside vendor in order to have the systems updated.
- The activity for this company was largely in process control systems. The largest contract put out to date was a \$6 million refinery automation project, of which approximately 55% of the costs represented software development.



EXHIBIT IV-5

A LARGE FRENCH MANUFACTURING ORGANISATION

- The manager interviewed said that he definitely saw a trend towards more use of outside resources for systems development, whether whole projects or parts of projects.
- He felt that this trend was not just limited to his own company but applied to France in general.
- The principal reasons given for this trend were:
 - Most projects are ad-hoc and not continuous. It does not make sense to employ your own staff since there is no permanent need for them.
 - Using outside contractors gives better access to new technology.
- There is also a tendency towards buying a standard solution wherever possible but, naturally, in many cases this is not possible.



CHAPTER V: SI VENDOR COMPETITION

V SI VENDOR COMPETITION

- This chapter identifies vendors operating within the European market who could be considered potential competitors in the SI business.
- Competition for SI business in Europe is likely to emerge from a number of directions. As in the U.S., participation in the market could potentially come from such groups as:
 - Computer manufacturers.
 - Communications companies.
 - Professional services companies.
 - Management consultants.
 - Aerospace companies.
 - Engineering and construction firms.
- This chapter provides some basic data about the emerging competitive environment in Europe, drawn largely from INPUT's continuous vendor research programmes and analysed by:
 - U.S. vendors.



- The U.K. market.
 - The West German market.
 - The Italian market.
 - The French market.
- One of the key features of the European competitive environment is the presence of alliances, consortia, or some other form of joint venture.
 - This emerges clearly from the information provided in Chapter III. To operate at a European level, particularly for NATO contractors, it is essential in general to achieve multination status, that is, to form a grouping in which each major country (at least) is represented. This seems frequently to be a political condition sine qua non.
 - For government contracts it is probably a necessity that the vendor be, at the least, heavily involved with a local company.
 - The counter to this is always product or service uniqueness. CSC operates in Europe on the basis of its perceived position as a relatively unique source of project management skills.

A. U.S. COMPETITION

- Since the SI market has to date been largely a U.S. phenomenon, it is not surprising that a number of U.S. organisations are active in the European marketplace.



- Exhibit V-1 lists the U.S. vendors known to be active in some way in Europe. Not all vendors listed are necessarily acting in the prime contractor role.

1. IBM

- INPUT considers that one of IBM's key problems in Europe is a lack of closeness to the customer. This may seem a paradox in view of IBM's justified market reputation for customer service. The point is that IBM has always maintained a very clear demarcation line between what is its responsibility to service and what is the customer's. IBM's standard sales terms maintain this position.
- This philosophy is threatened by user demand for a fuller service commitment at every level of the computer industry. Recent announcements by IBM in the area of customer service underline this.
- In respect to SI, IBM has to make the general transition towards total commitment to delivering solutions and away from the 'box shifter' mentality, albeit backed up by superb service.
- IBM has, it is believed, assigned 1,000 people worldwide to SI project teams. It has created a central organisation to support:
 - Advice and management of bids.
 - Approval process.
 - Project management.
 - Resource allocation.
- The operating SI organisations in the field will provide the project management and the pools of specialist resources.



EXHIBIT V-1

U.S. VENDORS ACTIVE IN EUROPEAN SI MARKET

- IBM
- DIGITAL
- EDS
- HUGHES
- GOULD
- CSC
- RAYTHEON
- UNISYS
- WESTINGHOUSE
- RCA
- ROCKWELL



- Target markets for SI are believed to be:
 - CIM.
 - Government.
 - Service industries.
 - Banking.
 - Insurance.
 - Retailing.
 - Medium-size companies.
- Whilst undoubtedly IBM has immense strengths in the European market for computer systems, it does have some significant weaknesses in relation to its capability to exploit emerging SI opportunities. These include:
 - Unable to fully commit to support of customers' complete problem because of its standard terms for doing business.
 - No current internal mechanism for handling complex bids and, particularly, subcontracting relationships.
 - Lack of ability to work effectively as a joint venture partner.
 - OEM capability/relationships limited to the bottom end of the market.
 - Limited relationships with major systems houses and professional services firms.



2. EDS

- The most active company in this arena from a marketing viewpoint has, of course, been EDS. It has in fact, been largely responsible for publicising the term 'systems integration' in Europe outside of the defence sector.
- EDS has, however, found it somewhat more difficult to translate this marketing awareness into sales success.
- In Europe, EDS presents itself as being involved in four key sectors of the industry:
 - Systems integration.
 - Facilities management.
 - Computer-integrated manufacturing.
 - Value-added network services.
- EDS's strategy in Europe in its non-GM business is to develop through acquisition. It took over UCSL in the U.K. three years ago and most recently (December 1986) took over the French services company SPI. SPI had a staff of approximately 500 people.
- Interestingly, EDS failed to take over Logica when it became clear that Logica was adamant that it wished to retain its independence. Hostile takeovers are disastrous in this sector.
- In Italy, EDS has set up a joint venture company with Olivetti called Integrated Systems Management. This company is targeted towards exploiting factory automation contracts, initially within Italy.



3. CSC

- CSC occupies a fairly narrow position within the computer services industry in general. Apart from Infonet, which has not been actively marketed for some time, CSC's chosen specialty areas are:
 - Defence.
 - Central governments.
 - Banking.
- Within these areas CSC is a highly regarded company, specifically related to its relatively unique skills in project management and its track record in developing large on-line systems.
- CSC has a strong project management training programme, and its Digital Systems Development Methodology (DSDM), originally developed for the U.S. government, is also perhaps an important factor.
- CSC tends to present itself not as a prime contractor but in a project management role, particularly in the government sector where overall management responsibility is retained by the responsible department.

4. OTHER VENDORS

- As indicated in Exhibit V-1, there are many other U.S. companies who have established some role in the European SI market.
- Digital, for example, amongst other major computer equipment manufacturers, is known to be placing considerable emphasis on developing and exploiting an SI capability in Europe.



- In the U.K., Digital has formed a defence programmes group to more closely track developments and be in a position to be involved in study contracts.
- Raytheon is a player in the European SI market, principally through its U.K. Systems House subsidiary Datalogic and its electronics subsidiary Cossor.
 - Datalogic has classed itself as a systems integrator for a number of years. Through Cossor Electronics, it can build custom hardware to meet a very wide range of possible needs.
 - Datalogic claims that about 30% of its business (1986 revenue was \$40 million in total) came from SI, of which the vast majority was for 'dealing room' systems in financial institutions.
 - In the last couple of years Datalogic has found it extremely difficult to grow its business significantly but are now benefitting from the high levels of investment in the finance sector. It expects to grow 20% compound over the next few years.
- Cossor employs about 2,000 people in the U.K. and is very active in the defence area. It believes that it is well placed to achieve a high proportion of the currently delayed IFF contracts.
- It is interesting to note that Boeing Computer Services has not yet made any significant moves in relation to developing SI business in Europe.
- Hoskyns (75% owned by Martin Marietta) remains on the fringes of SI as far as the market exists at the moment. Only recently has it obtained approval as a defence supplier, and it derives the majority of its business from two other service areas:



- Facilities management (specialising in organisations in transition from one equipment vendor to another).
- Software products, principally their MAS manufacturing control package.
- Arthur Andersen is known to be interested in commercial SI markets and has obtained at least one \$1.5 million contract which internally (within AA) is regarded as SI.
- Arthur Andersen is currently reassessing whether SI really is a fully exploitable opportunity for it.

B. U.K. COMPETITIVE POSITION

- In the U.K., competition for SI business can be basically identified as consisting of three key domestic groups in addition to the U.S.-owned companies:
 - The traditional electronics companies.
 - The systems houses (professional services companies).
 - Computer equipment manufacturers.
- Exhibit V-2 lists the most significant companies that are considered to be active in some respect in the SI business in the U.K.
- Some other vendors are active within the definition of the market but are not necessarily pursuing SI as a generic theme, for example, Reuters by virtue of having a very significant share of the 'dealer room' market.



EXHIBIT V-2

U.K. VENDORS ACTIVE IN SI MARKET

• TRADITIONAL ELECTRONICS COMPANIES

- | | |
|------------------------|-----------------------|
| - GEC (MARCONI/EASAMS) | - LUCAS |
| - BAE | - SMITHS INDUSTRIES |
| - PLESSEY | - HUNTING ENGINEERING |
| - FERRANTI | - VICKERS |
| - RACAL | - DOWTY |

• SYSTEMS HOUSES

- | | |
|----------|---------------------|
| - SCICON | - WS ATKINS |
| - SD | - HOSKYNS |
| - CAP | - LOGICA |
| - SSL | - ADMIRAL COMPUTING |



- In addition to the types of organisations mentioned above, there exists some other companies that potentially have the capability and appear to be making some moves towards being SI players.
- One of these is Atkins Planning, an engineering consultancy that has a very high reputation for its project management capability Atkins employs about 100-150 people in the U.K.
- Another organisation that appears to be targetting SI markets in manufacturing in particular is PA Computers and Telecommunications.
- PA offers what it describes as a Systems Integration service with a professional staff of around 350-400 worldwide. It has been involved in a variety of projects ranging up to 20 manyears in size. It is an approved MOD contractor.

I. BRITISH AEROSPACE (BAe)

- BAe is the U.K.'s biggest defence contractor and represents the merger (as a result of nationalisation) of the leading aerospace companies that developed in the post-war area in the U.K.
- BAe consists of a myriad of divisions and subsidiary companies with interests in aircraft, weapons sytems, project and test services, and space engineering.
- Not surprisingly, defence systems integration is a very key area for the company.
- BAe has, interestingly, taken a 25% stake in Systems Designers.



2. GEC

- Significant SI participation from GEC (no relationship with GE of the U.S.) is through its subsidiaries Marconi and Easams.
 - a. Marconi
- Marconi has a diverse and comprehensive involvement in electronics its principal areas of activity being:
 - Space.
 - Test/simulation.
 - Component technology.
 - Weapons guidance.
 - Radars.
 - Electronic warfare.
 - Data transmission.
 - Fire control.
 - Broadcasting.
 - Communications.
 - Merchant marine/offshore.
 - Underwater systems.



- Although Marconi is very defence oriented, it has significant interests in commercial systems integration, for example:
 - Air traffic control systems.
 - Airfield services.
 - Primary and secondary radar systems, including their associated command and control and ATC display systems.
 - Providing private data networks, e.g., British Telecom's Kilosteam service.
 - Inner-city earth stations for community services and offshore communications systems.
 - Computer-based command and control systems for the emergency and public services.
 - TV and sound broadcasting systems including payloads for direct broadcasting TV satellites.
- Marconi is involved in a number of joint venture company operations, notably with Hughes and Plessey for the U.K. Air Defence Ground Environment (UKADGE).

b. Easams

- Easams describes itself as the original systems engineering company. It is a completely autonomous organisation within GEC and claims dedication to a policy of complete impartiality and objectivity in the specification and selection of systems and equipment in both the defence and civil fields.



- Easams has four divisions:
 - Studies and Consultancy.
 - Weapons Systems.
 - Implementation and Support.
 - Information Management Systems.
- The Information Management Systems Division specialises in C³I systems.

3. PLESSEY

- Plessey has benefitted from the result of GEC's AWACS debacle through an agreement with Westinghouse Electric which is likely to bring in \$1.5 billion worth of business over the next ten years.
- This business will largely be for high technology design, engineering, and manufacturing in the defence field. All the early warning radar systems will be placed with Plessey Avionics.

4. RACAL

- Racal is a highly diversified electronics company with significant interests in the defence area.
- It has a Project Management Division specifically set up to handle large SI-type contracts.



- At this stage, it does not appear to be highly focused, gaining business in a variety of areas such as:
 - Government.
 - Manufacturing.
 - Retailing.
 - Finance.
- Racal has a diversified experience profile and has particular strength in voice and data networking systems.

5. SCICON

- Scicon International Limited is one of the largest companies in the world in the field of computer services, systems, and consultancy. With offices worldwide, Scicon International employs over 3,500 staff and had a turnover in 1984 of \$190 million. Founded in 1960, Scicon became a wholly owned subsidiary of The British Petroleum Company plc in 1966.
- Scicon International is a distinct business stream within BP, responsible for the parent company's interests in the computer systems business. Scicon International consists of Scicon Limited and Methods Workshop Limited (U.K.), SCS GmbH (Germany), GFI SA (France), SC Inc., SCT Inc., and Telecom General Corps (U.S.), and Sisco.
- Scicon's main U.K. operation, Scicon Limited, is one of the major elements. The company specialises in the design and implementation of high-quality mainframe, mini, and microprocessor-based systems together with the provision of bureau services. Over 20 years of projects for the industry, commerce, defence, and communications have given Scicon a proven



reputation for excellent work. Scicon is an approved defence contractor and is one of the few companies qualified to Defence Standard 05-21 for software, hardware, processing services, and project management and to the NATO Quality Control System Requirements for Industry, AQAPI.

- The company's skills include the provision of consultancy, management science, communication and control systems, information systems, bureau services, systems engineering, and a wide range of packages and products. These include engineering design, manufacturing and distribution management, factory automation, and data communications.
- The range of services provided by the company is supported by a research and development programme which includes projects in automation, robotics, data communications, human factors, expert systems, computer-aided instruction, trainers, and simulators.

6. SOFTWARE SCIENCES LIMITED (SSL)

- Software Sciences Limited (SSL) is part of the Thorn EMI Group, a major electronics company spanning a range of activities including white goods, brown goods, and entertainment.
- SSL has specialist experience in:
 - Command and control systems.
 - Communications.
 - Electronic warfare.
 - Sensor data processing.
 - Weapons systems.



- Logistics.
- Software technology.
- Life-cycle support.
- SSL is also a significant player in the 'dealing room' system market with their Continuous On-Line Trading (COLT) system.

C. WEST GERMANY

- Exhibit V-3 lists the principal indigenous West German companies that are potentially systems integration players.
- The major U.S. groups will, of course, be an important factor in the West German SI market; for example, IBM.
- As mentioned elsewhere in this report, the small but highly specialised engineering/consulting firms could well play a very significant role in the development of this market.
- Messerschmitt-Boelkow-Blöhm (MBB) is a significant aerospace company which through the consortia MBB-Erno is heavily involved in the European space programme.
- Large manufacturing organisations that are potential players are:
 - Mannesmann (owner of Kienzle, the office computer manufacturer) is a widely diversified engineering group.



EXHIBIT V-3

WEST GERMAN VENDORS ACTIVE IN SI MARKET

- **MESSERSCHMITT - BOELKOW - BLOHM (MBB)**
- **MANNESMANN**
- **AEG TELEFUNKEN**
- **SIEMENS**
- **SCS**
- **ADV-ORGA**
- **MBP**
- **GEI**
- **SOFTLAB**

Y-GRU



- AEG is a major electrical engineering company now a part of the Daimler-Benz group.
- Siemens is West Germany's premier electronics company and computer manufacturer.
- In addition to these, there are a range of software and services companies that have substantial skill reservoirs and that, consequently, are likely to figure in the future development of this market.
- Scientific Control Systems (SCS) is the West German subsidiary of the Scicon Group. SCS has obtained some embryonic SI-type work, primarily in the manufacturing sector.

D. ITALY

- There is little evidence in Italy of systems integration contracts actually being awarded. However, it is a strategic issue in Italy, as is demonstrated by the high level of activity in developing alliances that will position companies to take advantage of the emerging opportunities.
- Exhibit V-4 lists those organisations that are considered to be potential participants in the Italian SI market.



EXHIBIT V-4

ITALIAN VENDORS ACTIVE IN SI MARKET

- **SELENIA**
- **OLIVETTI**
- **FIAT**
- **FINSIEL**
- **PIRELLI**
- **ITP GROUP**
- **TELEVAS**
- **ITALTEL**



E. FRANCE

- The French market is in general terms the most significant computer service market in Europe and has as a result developed some large and powerful service companies. The most significant of these are:
 - CGS (CAP GEMINI SOGETI).
 - Sligos.
 - GSI.
 - Steria.
 - Sema-Metra.
- In terms of systems integration, the position is not so clearly defined. As yet, INPUT considers that SI is a very weak concept in France and that, consequently, there is only limited awareness amongst both users and vendors.
- The emergence of EDS with its 'missionary' marketing approach on the French market following its purchase of SPI has, however, brought the term into the everyday systems vocabulary.
- For example, CAP GEMINI SOGETI responded by issuing a short position paper to outline its presence in this market. This is included as Exhibit V-5.
- The French market demonstrates the generally observed situation throughout Europe already described elsewhere, namely:
 - The gradual development of larger and more complex projects, primarily from a nonadministrative DP origin and, therefore, from an environment used to subcontracting.



EXHIBIT V-5

CAP GEMINI SOGETI AND SYSTEMS INTEGRATION

- CAP GEMINI SOGETI is operating in all Western European countries as well as in the U.S.A.. The 1986 revenue will be around \$430 million. CAP GEMINI SOGETI is offering professional services and application development tools.
- We are involved in governmental as well as commercial systems integration, offering our customers all the possible answers fitting to their needs.
- We are very active in the telecommunications field. We realized the electronic directory in France (an over \$20 million contract) and are in the process to develop similar videotex systems for other European PTTs (Norway, Switzerland...).
- We conceived different networks for the French army, navy, and airforce (Artimon, Antinea, Reseda, Retinat).
- We developed control and command systems for various emergency services (British police forces, fire brigade...).
- In the finance area, we built a total insurance system for Skandia in Sweden, and we conceived the computer systems to handle the dematerialization of the stock market shares for a consortium of the French largest banks.
- In the industry, we developed a flight testing system for Fokker, and we are starting implementing computer integrated manufacturing systems.
- All these contracts are well over \$1 million, without including the hardware parts that we are always subcontracting.
- CAP GEMINI SOGETI is also prime contractor in some European research projects (ESPRIT, EUREKA).



Ex.V-5 (Cont.)

- In our accounts, systems integration are not isolated. They represent around 10% of our revenue, and they are in line with the revenue breakdown by activity sector:
 - 5% of our revenue derived from the primary sector
 - 31% " industry sector
 - 12% " telecommunication sector
 - 22% " financial sector
 - 19% " services sector
 - 11% " government sector
- This shows our good coverage of the total market.
- The growth rate for systems integration is expected to be at least equal to the one of the company, which will be around 20% a year, not taking into account potential acquisitions.



- No obvious breakpoint in the market--SI being used to describe \$0.5-1.0 million projects--most being of this size.
- One or two very large projects like the Electronic Directory which was \$30 million in value--to date the exception that proves the rule.
- Exhibit V-6 lists significant vendors who could be considered as potential SI vendors. Some of these vendors are commented upon in more detail below.
- CAP GEMINI SOGETI (CGS) is Europe's largest service company and is renowned for its strategic move at the end of the 1970s out of processing services and into professional services.
- CGS has grown very rapidly in recent years both organically and as a result of an aggressive takeover policy. Most recently, takeovers have included:
 - IBAT, a company in Germany providing computer services in process control and production control (October 1986).
 - GE-DA, an Italian company (December 1986).
- Honeywell-Bull is facing a particularly challenging period as it attempts to reform itself out of the recent merger.
- It is believed by INPUT it has have established a small group in Paris to attempt the formulation of a strategy to tackle SI markets. It is, however, believed to be very small and resource limited.
- This group is named Direction Ingenierie Conseil (DIC).
- In other areas of its business that could potentially be developed towards a fuller SI capability, Honeywell-Bull has made stronger marketing initiatives.



EXHIBIT V-6

FRENCH VENDORS ACTIVE IN SI MARKET

- THOMSON CSF
- CAP GEMINI SOGETI
- GSI
- SEMA-METRA
- STERIA
- SESA
- SYSECA
- GFI
- GIE EMERAUDE (BULL/SYSECA/EUROSOFT)
- SLIGOS



- For example, the company has stated that it is going to invest about \$50 million in attacking the U.K. market for manufacturing automation. To some extent, this initiative is dependent on continuing links with Honeywell's Control Systems Division, now separate from Honeywell-Bull.



CHAPTER VI: CONCLUSIONS

VI CONCLUSIONS

- This chapter provides a brief summary of the principal conclusions that emerge from this study conducted for GDS.

A. THE EUROPEAN MARKET

- The principal study objective was:
 - To assess the European systems integration market in order that GDS could determine whether it represents a realistic opportunity.
- This study indicates that there does exist a substantial systems integration market opportunity in Western Europe.
- In the key SI market of interest to GDS, contracts greater than \$5 million in value, INPUT has estimated that in Western Europe, this market could be worth around \$1.8 billion by 1991.
- The detailed analysis of that market, shown in Chapter III, clearly identifies where the market opportunities are thought to lie.
- The heavy emphasis on defence-oriented expenditure leads to the possible conclusion that other groups within Grumman Corporation, additional to GDS,



could have interests in these markets. Symbiosis between these interests could be beneficial to Grumman as a whole and its capability to exploit these market opportunities.

- Certainly the SI vendors identified by INPUT are operating in all of these related opportunity areas.

B. MARKET DEVELOPMENT

- The major force driving SI development in Europe is the need and the opportunity to exploit digital computer technology to every aspect of defence capability, manufacturing processes, and communications.
- Thus, the principal threat comes from the area of engineering and technical computing. This is in contrast to administrative computing where, although some major projects have been identified, the difficulties of project definition and management attitudes are currently inhibitors.

C. LOCAL PRESENCE

- It seems abundantly clear that it is a vital condition that an SI vendor have a substantial local presence in the target markets.
- Apart from the basic fact that organisations contracting out major projects will need and expect local management presence and support, these other key factors are vital:
 - Preference (prejudice) in Europe for local suppliers, particularly from government organisations.



- The need to build teaming managements or consortia in order to fully exploit the available opportunities and share the risk. For a U.S. organisation, the primary motivation is to acquire a European 'face'.
- The need to track developments over a long period and being available for study contracts in order to be in the running for the major projects that result are also important requirements.



APPENDIX A: MANAGEMENT PRESENTATION

APPENDIX A: MANAGEMENT PRESENTATION

- Exhibits A-1 through A-20 correspond to the presentation given to the senior management of GDS on April 24, 1987.
- References can be made to the full text for further elaboration and explanation.



EXHIBIT A-1

SYSTEMS INTEGRATION CONTRACTS

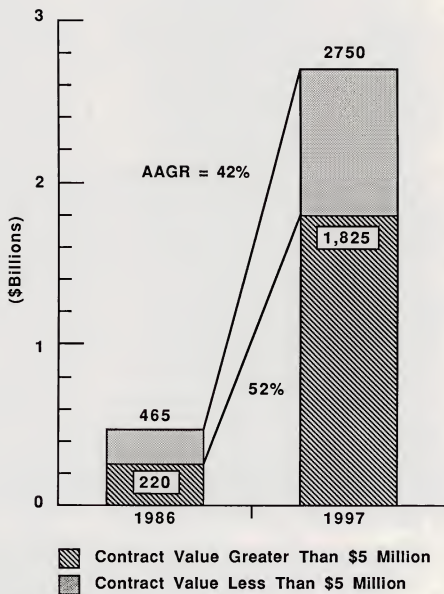
- **EMPHASIS ON**
 - **PROJECT MANAGEMENT**
 - **SUBCONTRACTORS**
 - **PROJECT DURATION**
 - **HARDWARE/SOFTWARE COMMUNICATIONS**

- **CONTRACT VALUE**
 - **GREATER THAN \$5 MILLION**
 - **\$1- 5 MILLION**



EXHIBIT A-2

EUROPEAN MARKET GROWTH



Y:GRU



EXHIBIT A-3

EUROPEAN MARKET OVERVIEW
(\$Millions)

	<u>1986</u>	<u>1991</u>
• NATO	80	120
>5 MILLION	75	110
<5 MILLION	5	10
• SPACE	-	40
>5 MILLION	-	40
<5 MILLION	-	-
• U.K.	200	770
>5 MILLION	60	435
<5 MILLION	140	335
• WEST GERMANY	90	690
>5 MILLION	40	460
<5 MILLION	50	230
• ITALY	15	455
>5 MILLION	5	320
<5 MILLION	10	135
• FRANCE	80	680
>5 MILLION	40	460
<5 MILLION	40	220
• TOTAL	465	2,750
>5 MILLION	220	1,825
<5 MILLION	245	925



EXHIBIT A-4

U.K. MARKET OVERVIEW
(\$ Millions)

	<u>1986</u>	<u>1991</u>
• U.K. DEFENCE	15	105
>5 MILLION	5	85
<5 MILLION	10	20
• GOVERNMENT	20	215
>5 MILLION	20	200
<5 MILLION	-	15
• MANUFACTURING	25	70
>5 MILLION	15	40
<5 MILLION	10	30
• BANKING AND FINANCE	100	235
>5 MILLION	10	35
<5 MILLION	90	200
• OTHER	40	145
>5 MILLION	10	75
<5 MILLION	<u>30</u>	<u>70</u>
• TOTAL	200	770
>5 MILLION	60	435
<5 MILLION	140	335



EXHIBIT A-5

NATO

- **INFRASTRUCTURE**
- **POLITICAL CHANGE**
 - **U.S./EUROPEAN VENDORS**
- **CONSORTIA**

**NATO MARKET FORECAST
SYSTEMS INTEGRATION**

1986 \$70-80 MILLION

1991 \$100-110 MILLION



EXHIBIT A-6

NATO CONSORTIA

- **AIRSPACE MANAGEMENT SYSTEMS**
 - LOGICA
 - BOEING
 - ALCATEL
- **COBRA MANAGEMENT CONSORTIUM - CMC**
 - FERRANTI
 - MARCONI RADAR SYSTEMS
 - SEL
 - ELECTRONIK SYSTEM
 - LE MATERIEL TELEPHONIQUE - PROFESSIONELLE
- **BAe/MARCONI**
 - NATO IV SATELLITES
- **EFA ADVANCED FLIGHT CONTROL**

GEC Avionics (U.K.)/Bodensleweik Geratechnik (WG)/
Aeritalia Avionic Systems and Equipment Group (Italy)/
Inisel (Spain)
- **CAP, FERRANTI, PLESSEY (Surface-to-Surface Shipboard Communication)**



EXHIBIT A-7

SYSTEMS INTEGRATION PROJECTS
NATO

• AIR COMMAND AND CONTROL (ACCS)	\$750 MILLION +
• COBRA (Counter Battery Radar)	\$750 MILLION+
• NATO IV (Satellite Communications)	\$150 MILLION +
• ACCIS Command and Control of Information Across Europe	\$1,000 MILLION
• FMCCIS Future Maritime Command and Control Information System	\$1,000 MILLION
• EDDS European Data Distribution	\$500 MILLION
• BICES Battlefield Information Communication Equipment System	\$750 MILLION
• BITS Battlefield Information Targeting System	\$750 MILLION



EXHIBIT A-8

OTHER EUROPEAN LEVEL OPPORTUNITIES

- SDI
 - CONSORTIA
 - LTV AEROSPACE AND DEFENCE
 - RCA
 - HUGHES
 - LOCKHEED
 - SNIA BPD (ITALY)
 - MBB (WEST GERMANY)
 - THOMSON CFF/AEROSPATIALE (FRANCE)
- SPACE
 - COLUMBUS \$130 MILLION
 - EUTELSAT \$ 30 MILLION
 - INMARSAT-2 \$ 30 MILLION
- EEC
 - LIMITED SCOPE



EXHIBIT A-9

SYSTEMS INTEGRATION PROJECTS
U.K. DEFENCE SECTOR

• TRIDENT	\$100 MILLION
• ADCIS SD& SSL Bidding	\$20-45 MILLION
• UKADGE U.K. Air Defense Ground Environment MOD Fighter Control Bases HQ Staff	\$400 MILLION
• SUCCESSOR Submarine Command System	\$130 MILLION
• CHOTS (Computer HQ Office Technology System)	\$150 MILLION
• UNITER Network	\$140 MILLION
• FASTNET Army Communications Network British Telecom (Plessey)	\$20 MILLION+



EXHIBIT A-10

U.K. DEFENCE SECTOR
(Systems House Revenues £ Millions)

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986*</u>
SCICON	8	10	13	16E
SD	7	10	15	20E
LOGICA	5.5	8	10.8	17
SSL	?	?	11	13E
CAP	3	3	10.5	12.5
YARROW			12.5	15E
OTHERS	≈20	≈30	≈40	≈50
	45	70	110	150
Commercial				25
R & D				15
Mission Critical				110

*E = Estimated

Y-GRU



EXHIBIT A-11

U.K. CENTRAL GOVERNMENT

• GDN (Government Data Network)	£200 MILLION +
• LOP (Local Office Project for DHSS)	£700 MILLION
• PIMIS (Home Office Passport Project)	£20 MILLION
• FOLIOS (Foreign and Commonwealth Office Secure Office System)	£10 MILLION
• PAYE	£9 MILLION



EXHIBIT A-12

GDN CONSORTIA

- **BT/CSC**
- **EDS/NORTHERN TELECOM**
- **ICL/CABLE & WIRELESS**
- **PLESSEY/CAP**
- **RACAL/SCICON**



EXHIBIT A-13

U.K. MANUFACTURING/ENGINEERING

• ROLLS ROYCE (Engine Testing System)	\$40 MILLION
• MOBIL (Lubricants Blending Plant)	\$10 MILLION
• SHELL LUBRICANTS	\$10 MILLION
• HEINZ	\$10 MILLION
• ROLLS ROYCE CAD/CAM SYSTEM	\$40 MILLION
• YAMAZAKI	\$3 MILLION
• BAILEY BURKETT	\$5-6 MILLION
• HATTERSLEY NEWMAN HENDER	\$7 MILLION
• JAGUAR (Genrad)	\$13 MILLION
• BP OIL	\$5 MILLION
• RED BANK MANUFACTURING	\$3 MILLION
• BLACK AND DECKER	\$9 MILLION
• JAGUAR (Comau)	\$75 MILLION
• JAGUAR (Carl Schenck)	\$12 MILLION



EXHIBIT A-14

U.K. BANKING AND FINANCE

• N&P BS (UNISYS/PLESSEY)	\$13 MILLION
• BARCLAYS (BIS)	\$1.2 MILLION
• NAT-WEST OFFICE COMMS (LOGICA DESIGN STUDY \$4 MILLION+)	\$100 MILLION
• DEALING ROOM SYSTEM	\$1 MILLION+



EXHIBIT A-15

U.K. - OTHER SI OPPORTUNITIES

- **TELECOMMUNICATIONS**
- **PUBLIC SERVICES**
 - **POLICE**
 - **POST OFFICE**
 - **FIRE SERVICE**
 - **HEALTH**
- **UTILITIES**
- **RETAIL AND DISTRIBUTION**
- **LOCAL AUTHORITIES**



EXHIBIT A-16

WEST GERMAN MARKET

- **MOD/DBP**
 - **BILDSCHIRMTEXT** **\$200 MILLION**
- **ENGINEERING CONSULTANTS**
 - **HAVE HIGH PROFILE**
- **SOFTWARE/SERVICE COMPANIES**
- **HARDWARE**
- **COMPETITORS**
 - **SCS**
 - **ADV ORGA**
 - **MBP (STEEL CO. AFFILIATE)**
 - **SOFTLAB**
 - **MANNESMANN (KIENZLE)**
 - **EDS**
 - **IBM**



EXHIBIT A-17

ITALIAN MARKET

- **PARTNERSHIPS**
 - OLIVETTI - EDS (SEVA)
 - DIGITAL - FIAT (COMAU) SESAM
 - IBM - STET
 - IBM - PIRELLI
 - HONEYWEL - SIRT
 - ENIDATA - SLIGOS
- **DEFENCE SECTOR**
 - DATAMAT
 - SELENIA
- **GOVERNMENT**
 - FINSIEL
- **MANUFACTURING**
 - MONTEDISON (MESA/TECHNIMONT)
 - PIRELLI (DIMA) ITP



EXHIBIT A-18

FRENCH MARKET

- | | |
|---------------------------------------|---------------|
| • HOME OFFICE
(SOPRA) | \$3 MILLION |
| • ANNUAIRE ELECTRONIQUE
(CGS/SESA) | \$200 MILLION |
| • GSIT
(SESA) | \$30 MILLION+ |
| • ESTEREL
(TRANSPAC) | |

COMPETITORS

- CGS
- SESA
- STERIA
- THOMSON
 - SYSECA
 - TITN
- CGE
- DGT (CEGECOM/TRANSPAC)
- BULL
- EDS (SPI)



EXHIBIT A-19

**CONCLUSIONS
EUROPEAN ENVIRONMENT**

- **SHORTAGE OF:**
 - **PROJECT MANAGEMENT SKILLS**
 - **TELECOMMUNICATIONS SKILLS**
- **SOFTWARE HOUSES COME OF AGE**
- **POLITICAL INFLUENCE**
- **FAILURES**



EXHIBIT A-20

CONCLUSIONS

- **THERE IS SUBSTANTIAL MARKET OPPORTUNITY**
- **ENGINEERING/TECHNICAL DRIVEN**
- **LOCAL PRESENCE**
 - **TEAMING**
 - **TRACK DEVELOPMENTS**



APPENDIX B: INPUT PROPOSAL -
SYSTEM INTEGRATION STUDY



APPENDIX B: INPUT PROPOSAL - SYSTEM INTEGRATION STUDY

- INPUT proposes a custom study for Grumman to study the potential market in Europe for systems integration.
- Objective: To determine whether the Western European systems integration market represents a realistic potential opportunity for Grumman Data Systems.
- Scope: The study will address the following segments of the potential systems integration market supporting the military/industrial area, namely:
 - Manufacturing.
 - Engineering.
 - Scientific.
- Intelligence on other potential markets, e.g., banking/finance will be collected wherever possible.
- The study will primarily assess the potential market in the U.K. and for NATO, but will also attempt to assess parallel markets in West Germany, Italy, and France.



- Methodology: INPUT will interview major European companies in the military/industrial area including potential subcontractors for computer systems and programming development in systems integration projects.
- INPUT will also make contact with representatives of appropriate government departments in order to confirm basic approaches, directions, and policies.
- INPUT anticipates interviewing up to 20 senior personnel in these various organisations, both 'face-to-face' and by telephone.
- Deliverables: INPUT will write a report to present its research findings to Grumman Data Systems and will make a presentation at Grumman Data Systems offices at a mutually agreeable date.
- Responsibility: The project manager for this study will be Mr. Peter Lines, an INPUT principal consultant and manager of INPUT's European research programmes.
- Fee and Schedule: The fee for the project as specified will be \$16,500 plus any direct expenses (travel, etc.) which are estimated not to exceed 20% of the basic fee.
- INPUT would, following authorisation by Grumman Data Systems, be able to commence work on this project by the end of February 1987.
- Confidentiality: This study would be proprietary to Grumman Data Systems, and INPUT would not identify Grumman as the sponsor of the research.

